THE BRICKBVILDER

VOLUME XXIV JULY, 1915 NUMBER 7

Stairways in Houses of Moderate Cost.

II. THE COLONIAL TYPE OF STAIRWAY.

By JOHN T. FALLON.

THE predominance of tradition in the history of a nation's architecture is more or less axiomatic. Even with the access to all that has been done in the past which modern artists possess, it is impossible to transplant a style racially different from our own and to cause it to grow and take root. It will inevitably die a natural death, as has been proven by Richardson's experiment with French Romanesque, or, if it becomes a vital element of our own work, it will take on a recognizably different aspect.

Now, from the early days of the colonies, up to the decline of taste in the Mid-Victorian Era, our main outside artistic impulse came from England, from which source we inherited our habits of living and in a restricted sense our ideas of domestic planning. The great accessibility in this country of wood as a building material changed substantially the forms and details of the Colonial house from those of Georgian England, but the stairway is one of the exceptions from this statement. We have seen in a previous article that the English stairs were built of wood, and consequently little or no adaptation was necessary to the importation of this feature.

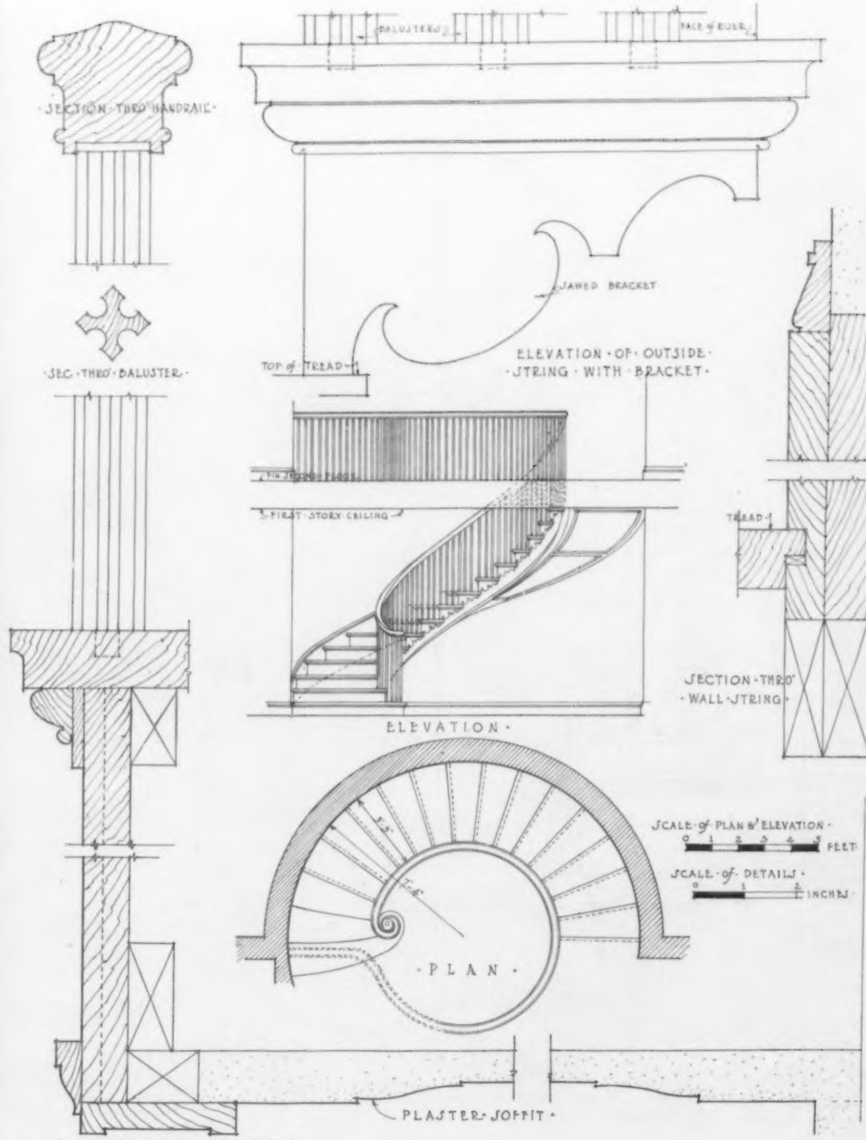
Stairway in the House of Rev. Joseph Hutcheson, Warren, R. I.
Charles A. Platt, Architect

The hall invariably extending through the width of the house, with the stairs at one end, is distinctly Colonial, as was the same tendency repeated in the simple rectangular planning of the living rooms. However, the Jacobean arcade, shutting off the staircase from the hall, persists in Colonial work. This division takes now the form of an elliptical arch, now the form of a beam supported by columns with varied spacing or even without support.

In both English and American houses, the stairs usually run in short straight flights, then a quarter landing, then another flight at right angles. The Colonial type of house usually demanded a door under the landing, which influenced their designers to make the first flight of sufficient length to bring the first landing to the proper level to allow for this door height. The width of the hall sometimes operated to suppress the intermediate flight and to make necessary only one landing.

A recent writer has thus summarized the typical Colonial plan: "The first flight rising from the first floor contained roughly two-thirds the total number of steps needed to reach the second. At the top of the flight was a level landing crossing the hall. Thence continuing to the floor above was a second flight containing the remaining one-third of steps. By this means head room was obtained under the landing for a rear entrance to the hall. The scheme adopted in some modern Colonial houses of having a flight on each side of the hall ascend to the landing, with a shorter flight continuing to the second floor from the center of the landing, has no counterpart in Colonial work. But it is not an unreasonable elaboration of the style; and that we have no example in old houses is perhaps only because the arrangement calls for a larger scale of building than the means of the Colonists afforded. The introduction of steps in the landing, causing a break in its level, is only to be seen in a few houses built towards the end of the eighteenth century."

This introduction was not a space-saving compromise, as he has pointed out, but a distinct step towards the elliptical stair that rose in one flight from floor to floor, as may be deduced from the absolute elimination of the newel, already suppressed in importance, and the rounding of the landing corners, carrying rail and string up in one warped line. The full elliptical stair is a development that was reserved for a few late Colonial examples of the early nineteenth century. The increasing technical skill of the stair builder was shown in this last phase, which is comparable in the mastery over materials with



STAIRWAY IN HOUSE OF WILLIAM M. IMBRIE, ESQ., ENGLEWOOD, N. J.

MANN & MacNEILLE, ARCHITECTS

Stairway in House at Kensington, N. Y.
Aymar Embury II, Architect

the finest efforts of contemporary French stone masons.

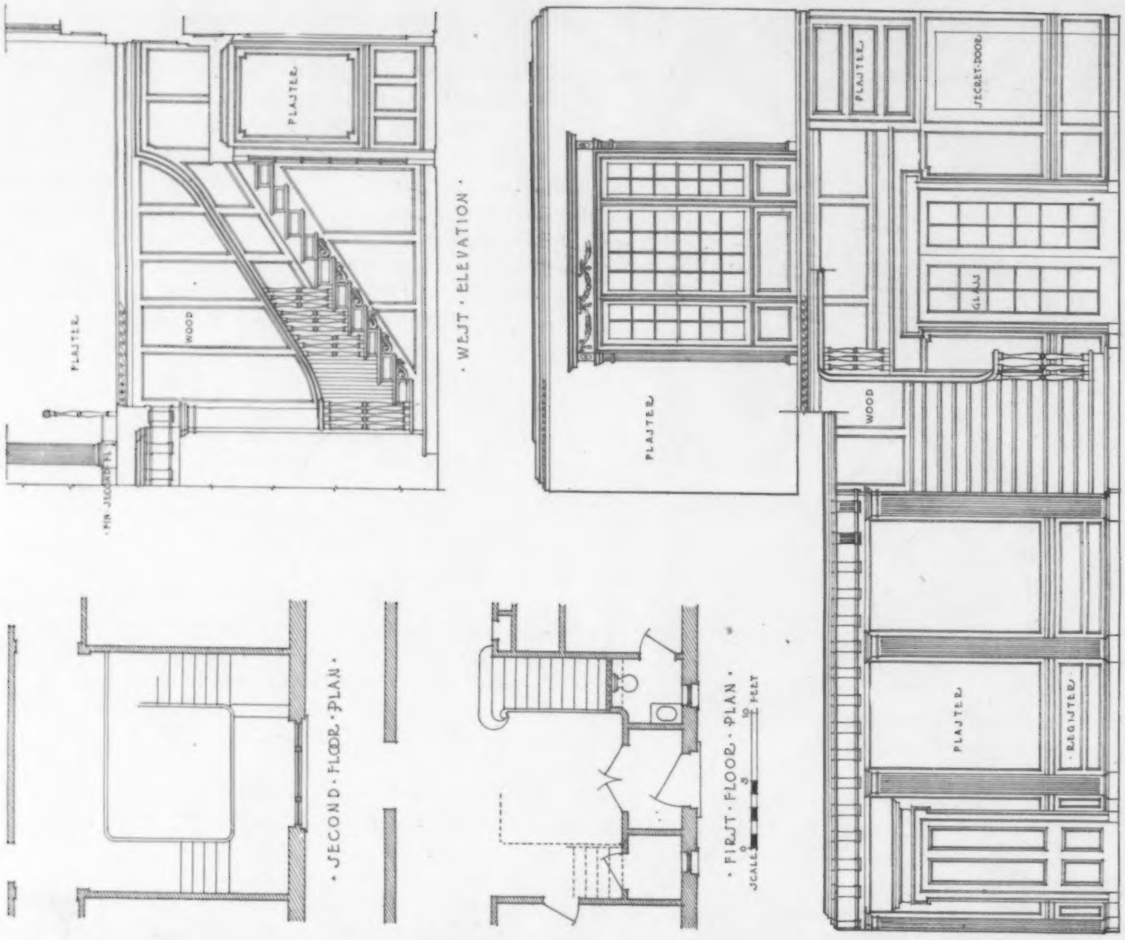
Before discussing more fully the details of the Colonial stair, it might be well to call attention to the association of Georgian work with the use of mahogany, and to review the causes that led up to it. This wonderfully colored wood, with its inimitable grain, is indigenous to Central America and the West Indies. Its beauties were first discovered in 1595 by one of the members of an expedition of Sir Walter Raleigh, but it was not until the opening of the eighteenth century that its suitability for cabinet work and furniture began to attract attention. It came rapidly into vogue, primarily through the efforts of Dr. Gibbons, who influenced a wood carver named Wollaston to bring it to the notice of the British public. It was originally imported from Jamaica, where the bulk of the eighteenth century supply was obtained, the exports from this island being 521,300 feet in the year 1753.

The use of mahogany for the hand rails of Colonial stairs was general. This part of the stair is naturally subjected to great wear, and a wood of hard texture and handsome grain is demanded. Mahogany fulfils these conditions admirably. Its use was seldom extended to the spindles and treads, as considerations both of cost and of taste prevented a wider employment. The hand rail became more delicate as the development went on; its profile was generally classic and refined, although occasionally a simple round section was used. It was carried continuously from floor to floor, a suppressed baluster newel being used to turn the corners. A favorite modification was the sweeping rise of the rail at the landings, as if to surmount the newel. A half section of the hand rail was often repeated along the top of the wainscot. This stair wainscot, which is so often omitted entirely in modern houses of the inexpensive type, was inevitable in the old work; in the cheaper houses it was usually preserved in line by a simple wall moulding carried up at the height of the rail. These wood wainscots were never elaborate affairs; generally, they consisted of simple panels with occasionally a balancing of the newels by a flat pilaster treatment.

As mentioned in the previous article, the Georgian development of the baluster led to attenuation and delicacy. A usual treatment was the use of two or three different designs to a tread, although this is not inevitable. Indeed, a favorite variation from the turned types was a square spindle, sometimes with groovings on the face and sometimes without. The start of the rail was made from a small, unobtrusive newel surrounded by a circle of balusters. The other variant, a start from a prominent and projecting newel, although frequently used, was never particularly happy.

The string was always an open one with step ends in console form, sometimes beautifully carved, but more usually with a simple design cut in the flat and applied. The infinite variation in these designs adds great fascination to the study of these old stairways. It was not until the end of the period that the landing newels were entirely done away with and the string continued in one line; in most of the examples, the newel projected down to receive the string and to be ornamented below by some simple drop.

Stairway in House of C. D. Gibson, Esq., New York, N. Y.
McKim, Mead & White, Architects



STAIRWAY IN THE HOUSE OF J. P. GRACE, ESQ., LAKEVILLE, LONG ISLAND, N. Y.

JAMES W. O'CONNOR, ARCHITECT

The soffit of the stairs demands some attention. In the older work the first flight was usually supported by a base of paneling, and the soffit so concealed. The soffit of the top flight was filled in flat with plaster on a line with the bottom of the string, sometimes paneled and sometimes left plain. The practice of showing the soffits of the individual steps as if they were solid blocks, common in the late English stairs, was used in very few instances, one being that of Shirley in Virginia.

The painting of Colonial stairways was always white, and any other color now seen on the woodwork of an old building may be safely assumed to be of a later date. The only contrasting notes to this monotone color scheme was the rich tone of the mahogany hand rail and wainscot cap. The wall of the staircase was whitewashed, if a simple house, or papered with imported wall paper in the larger houses. Here may be said to be another Georgian innovation. Although there were examples before this time, wall paper first came into general use in this century. The early wall papers used in Colonial days were printed by hand on square pieces of hand-made paper from wood blocks, and it was not until 1800 that roller presses began to be introduced. The designs were first copied from figured velvets and brocades, but soon landscape and architectural subjects replaced these and continued in vogue through the period of the Empire.

The problem of the stairs in modern houses of moderate cost can hardly be said to have received the study that our ancestors gave to it. When the traditional types of Colonial stairs are faithfully copied, not merely in detail but in the essentials of planning, we produce examples that are, at least, comparable with the antecedents; but generally in the more inexpensive houses the problem is slighted and neglected.

The illustrations show how eminently suited to our modern life are these Colonial types, and how even in a literal transcript the selective faculty may be exercised to produce not a finer model, but stairways that bear comparison with the high water marks of the eighteenth century. Occasionally, French or Italian detail is introduced into the design to give a modern flavor or to produce an air of sophistication that our forefathers' work lacked. But, on the whole, it may be said that for practical utility and as an æsthetic inheritance, the Georgian stair is one of the most important influences in American interior architecture. Tastes may veer in one direction or another, but the basic elements of our stairway designs will waver little from the Colonial stair.

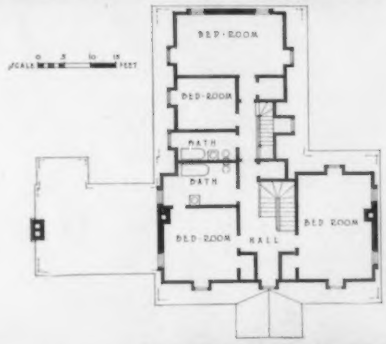
The art of the stair builder was in earlier days an important component of the building trades. It is certain that the present day artisans are not less skilled, but, since the architect has laid less stress on the design of the stairway, the artisan has come to have less training in its construction. Discussion has recently centered upon the training of the individual workman as a means towards the elimination of the stereotyped and conventional in architecture. Stair building as a trade has been only imperfectly transmitted to the present generation of workmen, but by a conscious effort on the part of the architect to keep this feature on the high plane to which it once rose, its structural possibilities could be once more easily realized and its design thereby improved.

Stairway in House of Robert J. Collier, Esq., Wickatunk, N. J.
John Russell Pope, Architect

GARDENER'S COTTAGE,
THE LANE ESTATE

ST. JAMES, LONG ISLAND, N. Y.

FORD, BUTLER & OLIVER,
ARCHITECTS



The Heating and Ventilation of Schoolhouses.

By HAROLD L. ALT.

THE subject of heating and ventilating the schoolhouse has undoubtedly been given as much attention and thought as any other one particular type of building, and it is quite possible that, owing to the constant recurrence of this problem in all portions of the country, it might be said that it has been met by a greater variety of solutions than can be found in any other form of building. Yet, with all of the thought, time, and money which has been put into this problem, it is a peculiar fact that it is not yet possible to assert that the perfect ventilating system has been devised.

In the first place, — what *is* a perfect ventilating system? We cannot by any possibility maintain air inside of a building at the standard of purity possessed by the air before entering, owing to the fact that impurities are constantly added to the air within an occupied room. The only exception to this is when the outside air is so bad that mechanical or physical methods of cleaning may remove a quantity of undesirable exterior elements which might be accounted more deadly than those which the air would pick up within the room before being expelled through the vent openings.

It is not within the province of this article to enter into the theory of ventilation so much in regard to the scientific or medical side as it is to point out to the conservative architect the methods which are giving the greatest satisfaction today according to the standards based upon well recognized and generally accepted theories. Yet, in passing over this point of the discussion, it is hard to omit the mention of an actual test in a regular schoolroom operating under normal conditions. It was demonstrated that it is possible to re-use the air of the fully occupied room for continuous periods of three hours with the usual recess interval and without the use of any of the outside air whatsoever, except that which leaked in through crevices and occasionally opened doors, it being impossible, of course, to keep the class rooms absolutely air tight. It is also interesting to note that this test was carried on for five hours a day for three weeks without perceptible effect on the school children, who were carefully observed by experts making psychological and physiological tests; these tests were compared with a corresponding class in another room which was ventilated according to the best standard methods and practices of to-day, with no apparent difference between the two.

In spite of this experiment, however, there are few who are yet ready to admit that fresh air is not required or that the condition of the air in a room can artificially be made as desirable for human beings without a fresh air supply as with it. Until experiments demonstrating this fact have been made in multiple, with results of an invariably successful nature, the engineer and architect are not justified in departing from the old standards of the required amount of fresh air per pupil per minute.

It is a question if the average architect in designing a schoolhouse takes into proper consideration on his preliminary sketches the requirements of the ventilation system. While the modern trend is towards the elimination of this trouble, there are still many architects who cause themselves much needless work and later revising of plans by not making proper allowances in the preliminary drawings for the necessary ducts and flues.

In schoolhouse ventilation work there are three systems of piping which are in common use. These may be termed the trunk line, or single duct system, the double duct system, and the individual duct system.

The trunk line system is the one which is most familiar, a large percentage of the air blast duct work being laid out by this method. The double duct system, which consists of a warm air duct supplying two-thirds of hot air and the cold-air duct supplying one-third of cold air to the base of the flues, the air becoming mixed in the flues and entering the room at a desired tempered degree, is also fairly well known.

The individual duct system, however, has advantages over the other two. This system gives every room its own duct and flue continuously

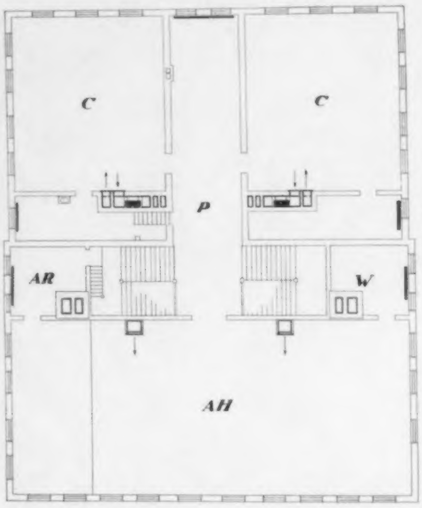


Fig. 1

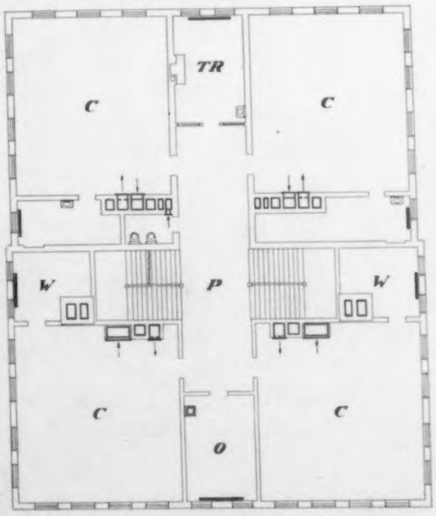


Fig. 2

In the plans accompanying this article the rooms have been indicated by letters as follows:

A	*Auditorium*	*GL*	*Girls' Locker*
AH	*Assembly Hall*	*GP*	*Girls' Playroom*
AR	*Anteroom*	*L*	*Lavatory*
BP	*Boys' Playroom*	*LY*	*Library*
BL	*Boys' Locker*	*P*	*Passage*
BR	*Boiler Room*	*RR*	*Recitation Room*
C	*Class Room*	*TR*	*Teachers' Room*
CR	*Coal Room*	*V*	*Vestibule*
G	*Gymnasium*	*VR*	*Voting Room*
		W	*Wardrobe*

The apparatus has been indicated as follows:

AW	*Air Washer*	*H*	*Heater*
B	*Boiler*	*R*	*Re-heater*
D	*Damper*	*S*	*Screen*
F	*Fan*	*T*	*Tempering Heater*

from the fan to the room outlet and regulates the temperature of the air to suit the requirements of each individual room. It has been found by experience that rooms situated on the north and south sides, or on the windward and leeward sides, of a building will not require air at the same temperature, the difference being several degrees. The main objection to the common trunk line system ordinarily used is that this variation of requirement cannot be satisfied.

Another advantage possessed by the individual ducts is the matter of head room in the basement. The argument is often advanced, however, that the double ducts, with the air mixing in the vertical flue, give the same temperature control as the individual duct in which the air mixes back at the heater, and at the same time they permit the use of the trunk line system. This is true, but between the heater and the base of the flue not only must two ducts be carried, but they must have a cross-sectional area of approximately 50 per cent more than actually required. This is clearly understood when it is noted that on a very cold day the cold air duct may be almost entirely shut off at the base of each flue, thus requiring *all* the ventilation for the building to come through the hot air duct, while on a warmer day the warm air duct may be 50 per cent closed and the cold air duct utilized to its full capacity. Therefore, where these ducts are extended along the basement ceiling, as is usually the case (or any place where head room is an object), the individual duct will make an appreciable saving in the height.

The first form of heating which was applied to schoolhouses was that of the fireplace and the stove. Later, however, as advancement in the art of heating became more pronounced and ventilation was required, furnaces were substituted and are still in use at the present time in some of the older schools, although generally with more or less dissatisfaction.

In order to show the progress of modern heating and ventilation, let us first take Figs. 1, 2, 3, and 4, which show the third, second, first, and basement floor plans respectively of one of the older schools of moderate size in which furnaces had been in use. These furnaces required maintaining four separate fires, and at their best were subject to back drafts on days of high winds and to other gravity hot air heating troubles as well. This school was recently remodeled as shown, so as to eliminate these troubles and to give a ventilation system furnished by gravity at times when outside conditions made such operation feasible, and at the same time to avoid the troubles usually experienced with the plain gravity system.

To accomplish this a fan F was installed which would force the air into the heating chambers, across the heaters and up the flues, thus assisting gravity enough to counteract adverse outside conditions.

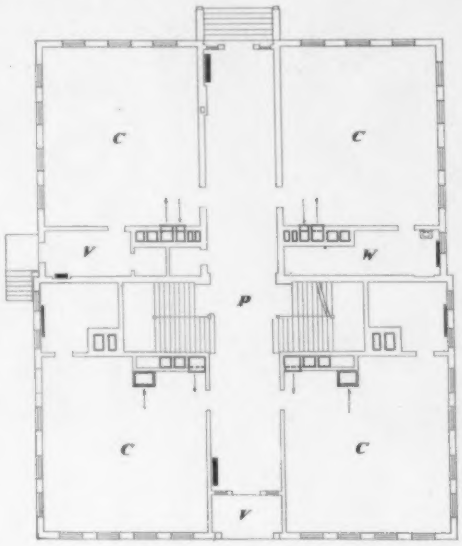


Fig. 3

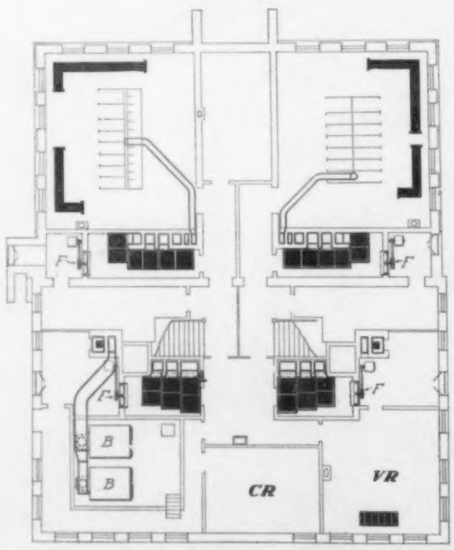


Fig. 4

It is not intended to hold up this school to the architect as an ideal installation, but rather to employ it as a means of showing what can be done to improve the existing unsatisfactory furnace systems. Owing to this being a remodeled system, some of the flues were installed by necessity in places where, architecturally speaking, they have no business being located; but this could, of course, readily be overcome in a new building properly designed to accommodate the ventilating system.

The exhaust flues are heated with vertical aspirating pipes, assisted by radiators located in the flues at the third floor, as shown in Fig. 1.

Some time after this school was remodeled another school building was erected a short distance away and connected to the old building by means of a pipe tunnel. The plans for the new building are shown in Figs. 5 to 8, inclusive, which are the attic floor, second floor, first floor, and basement plans respectively. In this later school, as shown in Fig. 8, an air filter screen S was installed, together with a fan F, which forces the air over the heating coils H. The system is arranged so that either the gymnasium, the auditorium, or the class rooms may be used at different times, all supplied from the same fan F, the flues being opened and closed as desired through a system of switch dampers.

In the attic plan, Fig. 5, it will be seen that the exhaust flues are connected together and carried through the roof, circulation being assisted by the heaters H, which make aspirating flues out of these vents.

This arrangement is a step in advance of the arrangement in the older buildings, having a more positive air supply movement, a certain amount of temperature control, filtered fresh air, and a concentration of apparatus.

Of course a fan system on the vents is also most desirable, as this produces an almost constant pull on the rooms, rendering it possible to regulate the quantity of fresh air much more closely than when aspirating flues are in use. It is quite remarkable the amount of differ-

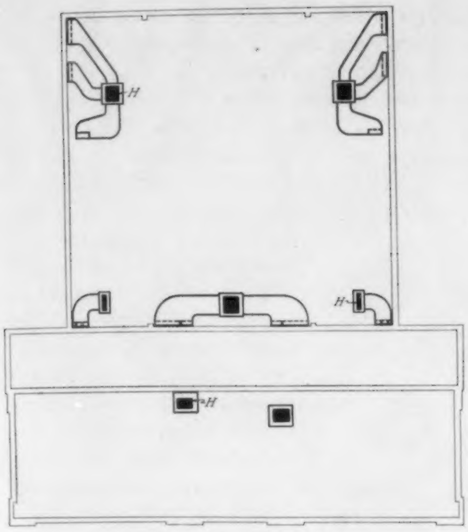


Fig. 5

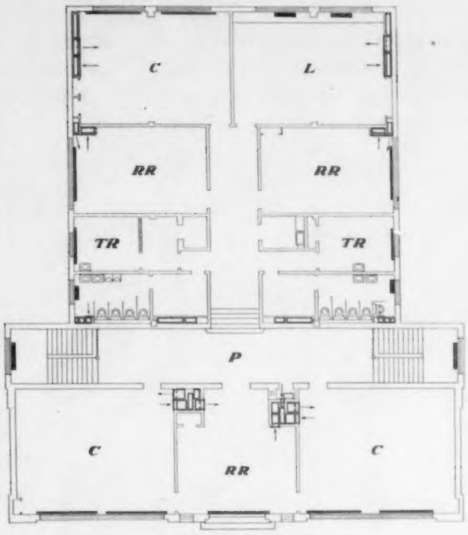


Fig. 6

ence made in the amount of incoming air by the assistance given through the exhaust outlets.

Still further progress is indicated in Fig. 10, where the individual duct system is used and individual temperature regulation thus secured for the various rooms. For the purpose of this discussion the upper floors of this building may be assumed to be treated in a manner similar to the floor plans already shown. The small additional plan of the boilers shows the smoke connection and method of running the flue into the chimney.

The basement plan, shown in Fig. 10, is an especially good typical duct, illustration showing as it does the use of the individual ducts for the class rooms located with varying exposures, combined with a large trunk line duct supplying the auditorium above. A system of switch dampers is installed, throwing either the class room (*i.e.*, the small individual ducts) or the auditorium (*i.e.*, the large trunk duct) into service as desired.

The chief weakness in this installation consists of the lack of facilities for cleaning and purifying the air, it being absolutely impossible to install either an air washer or a filter screen in the space allotted to the ventilating plant. This is, perhaps, not quite as serious a consideration in this particular case as it might be under other conditions, owing to the fact that this school is in a suburban location where the air is of unusually clear character.

The ideal layout of a ventilating system to which it is desired to call the reader's attention is shown in plan and elevation in Fig. 9, this being one of two sets of apparatus of identical nature now being installed in a new high school in process of construction. In this particular school the apparatus shown is purely a class room proposition, taking care of all rooms on the left side of the building. The other apparatus is situated across the corridor and furnishes air for all the class rooms on the other side of the building. The auditorium and gymnasium are supplied by a third apparatus situated in the rear, thus making it possible to operate all sections of the entire school at one and the same time instead of in parts alone as was necessary in the other layouts.

In Fig. 9 the air enters through the window screen and passes in front of the tempering heater T, from which it is drawn through the air washer AW and heater H by the fan F. This fan is set in an enclosure which is made as air tight as possible, owing to the fact that the fan takes its suction directly from the room, thus making a plenum chamber out of it. The discharge from the fan is blown partially through the re-heater R, and partially through a by-pass beneath the re-heater, as indicated in elevation in Fig. 9. Here it is forced into the pipes P, which pick up the air and carry it to the various room outlets, the horizontal runs in this particular case being carried in a tunnel beneath the floor of the basement corridor. This is an ideal arrangement, which, however, requires all heat

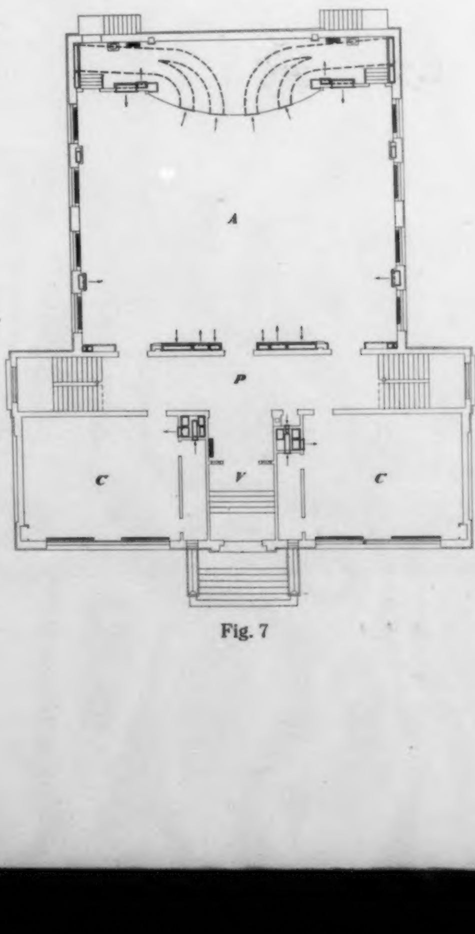


Fig. 7

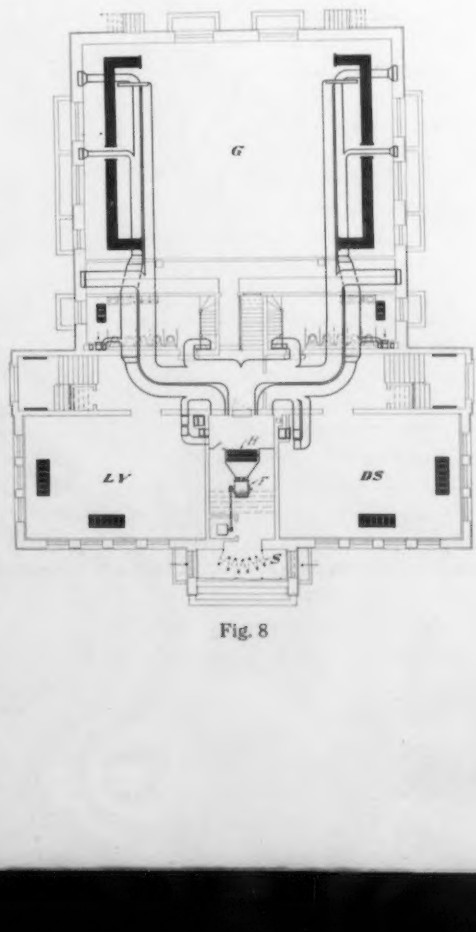


Fig. 8

flues to be carried down to the basement floor instead of stopping off at the basement ceiling as is customary.

The respective ducts obtain individual temperatures by the amount of hot and tempered air admitted by the dampers D. These dampers are governed by a thermostat located in the room which the duct supplies, and thereby determining the temperature of the air entering the room.

The architect will undoubtedly at once question the cost factor on these more or less ideal systems of heating and ventilation. The most approved system — including air washers, heaters, and fans of sufficient capacity to supply every pupil in every class room with 30 cubic feet of air per minute, and to give every seat in the auditorium 20 cubic feet per minute, besides supplying anywhere from four to ten changes of air per hour, as may be required in the various other rooms throughout the building — will cost from 2.1 cents to 2.8 cents per cubic foot, according to the amount of horizontal run and other variable factors, the average for a large number of schools approximating 2.4 cents per cubic foot.

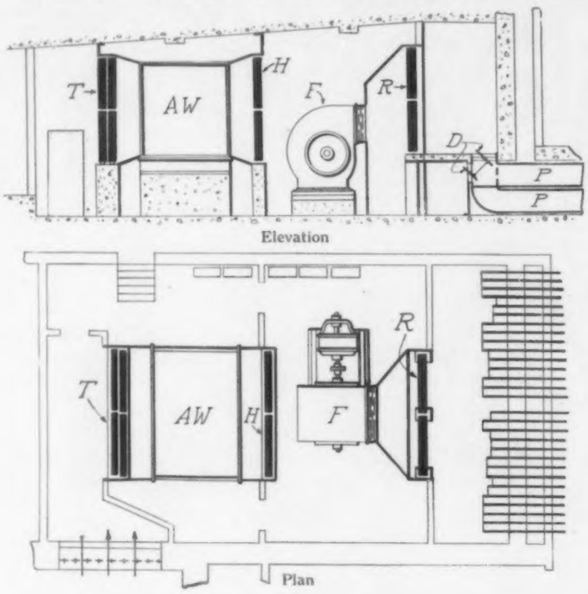


Fig. 9

It is often considered advantageous to install an auxiliary system of direct radiation, but many architects are opposed to the use of direct radiation in a building where air is supplied for ventilation, arguing that it is much cheaper to increase the temperature of the entering air by adding a few more sections on the heater than it is to carry steam pipes throughout the building and to install anywhere from two to six or eight radiators per room.

As far as first cost is concerned this is entirely correct, but the operating cost is excessive, owing to the large power bills which are incurred during the periods when the school is not in use, during which periods, however, heat is necessary to afford protection against the danger of freezing.

With direct radiation installed in the rooms no electric power need be expended from Friday afternoon until the following Monday morning, the temperature in the building in the meantime being maintained by the direct radiators without ventilation. When the hot blast system is used alone, either cold outside air must be heated and driven within the building in order to maintain the required temperature, or a by-pass must be arranged from the vent fan into the supply fan so as to revolve the air without the use of an outside connection during this period. This by-pass is sometimes not only difficult to obtain, but where the vent fans are located on the roof, or in the attic space, is absolutely impossible.

It is, moreover, very undesirable to use the hot blast system for heating such rooms as toilets, vestibules, kitchens, lunch rooms, and, in fact, any rooms from which there is a possibility of odors being spread throughout the building.

Since it is necessary, therefore, to install *some* direct radiation and to run steam supply and return mains for the heating of these particular rooms, it does not require an excessive amount of additional piping to locate the risers so that they may feed radiators in every room. It is certain that the interest on the additional expenditure involved by this installation would not be as great as the expense incurred in using power to run the hot blast system when it is being operated for the purpose of maintaining a satisfactory temperature during the period intervening between sessions.

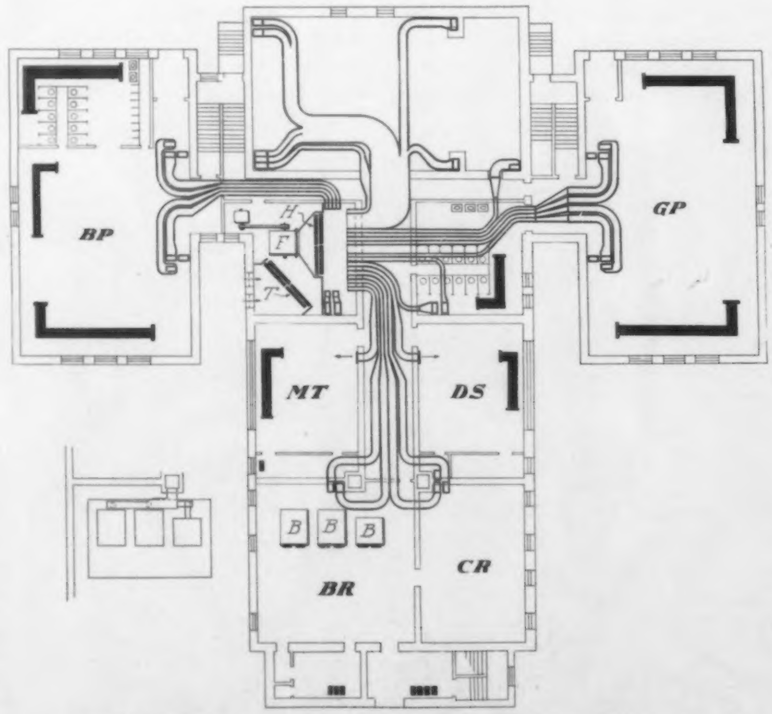
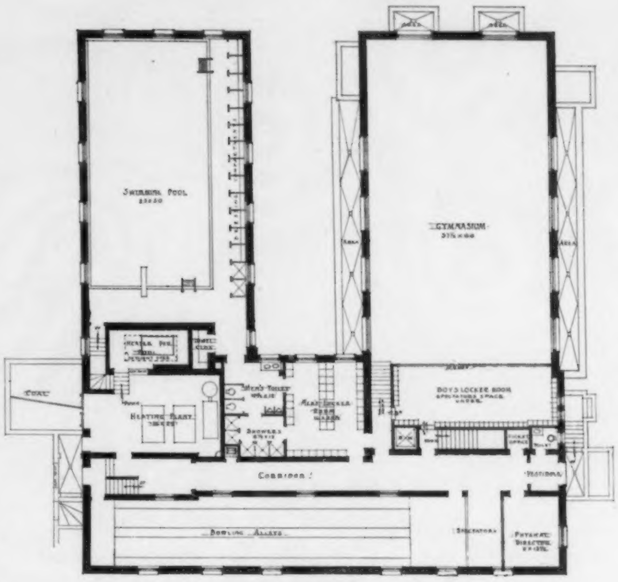


Fig. 10. Showing Arrangement in Basement of an Individual Duct System

Church Club House, St. Paul, Minn.

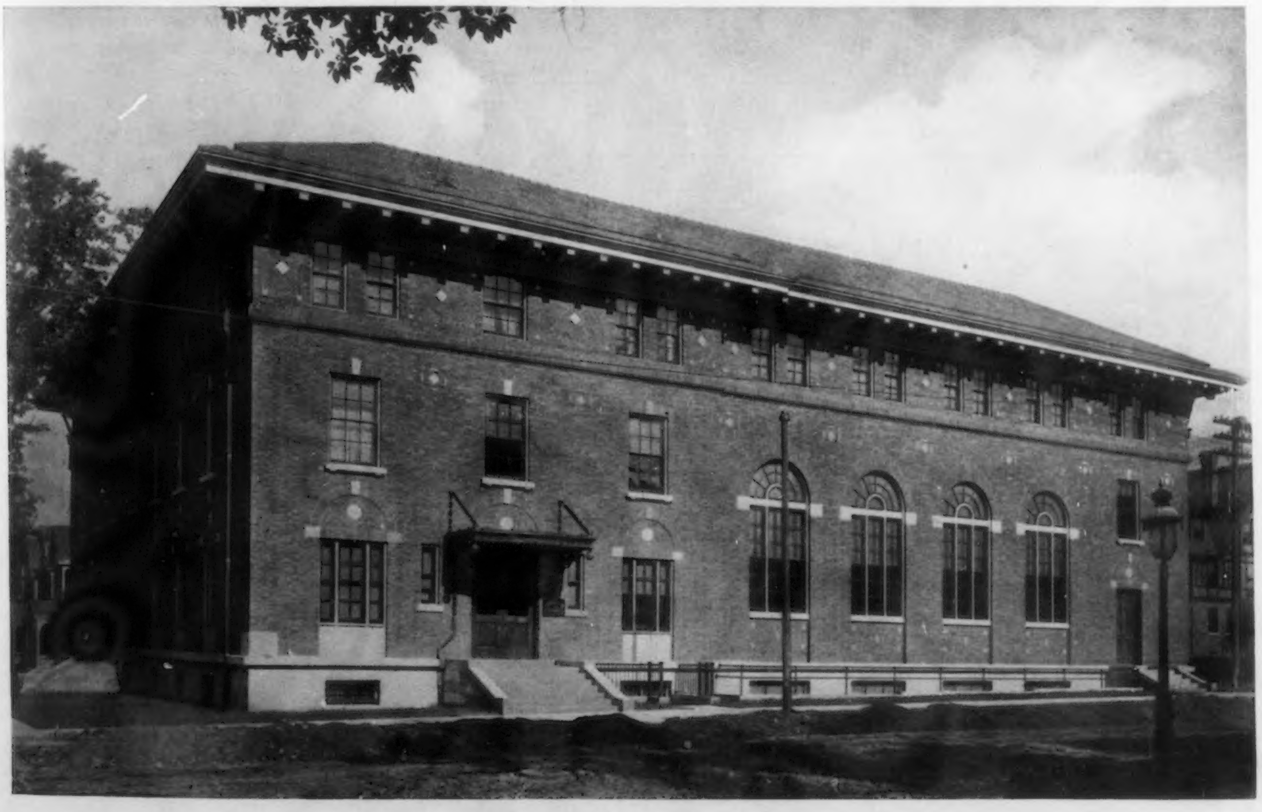
FREDERICK H. BROOKE, *Architect.*

THE Church Club House, which is illustrated here and which has recently been completed in St. Paul, is the outgrowth of a demand for a building to serve the social needs of the very large number of young people in that section of the city commonly known as the "Hill District." Although there were enough good homes, churches, and schools in this district, there was not one public building equipped to offer a place for legitimate amusement and needful recreation. This building was planned to provide such equipment in the community, and thus keep the young people in the wholesome environment of their own neighborhood.



Basement Plan

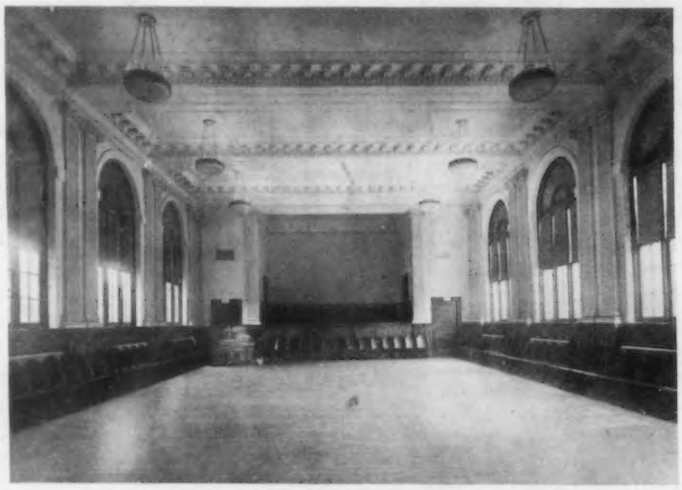
Athletic activities are given their due importance, the space devoted to them occupying the entire basement, in addition to a special wing one story in height. This wing is occupied by the swimming pool, which is 25 by 50 feet, and has a depth of water ranging from 4 to 8 feet. Along one of the side walls are private dressing compartments and a few showers. The other wing of the basement is taken up by the gymnasium, while between the two wings are the lockers and showers. In order to get the necessary height to the "gym" ceiling, the floor of that part is lower than in the rest of the basement. At one end is a space for spectators and above this are the boys' lockers. Across the front of the building are the bowling alleys and the office for the physical director. The heating plant and its accessories are also on this floor. A dumb waiter connects the gymnasium with the kitchen above so that large banquets are possible, while direct access to the outside



Church Club House, St. Paul, Minn.
Frederick H. Brooke, Architect

by a separate vestibule and stairway makes it possible to use this part of the building independently of the rest.

The principal part of the main floor is given to the auditorium, which, with the gallery, seats about 550 persons. At the end is a good sized stage and four complete dressing rooms, through which are the necessary emergency exits. The kitchen is on this floor and is directly connected to the auditorium by the serving room. Here again the plan has been so arranged that this particular part may be used without interfering in any way with the other activities of the building, and for this purpose a special lobby is provided with ticket office and coat room.



Auditorium, Looking Towards the Stage

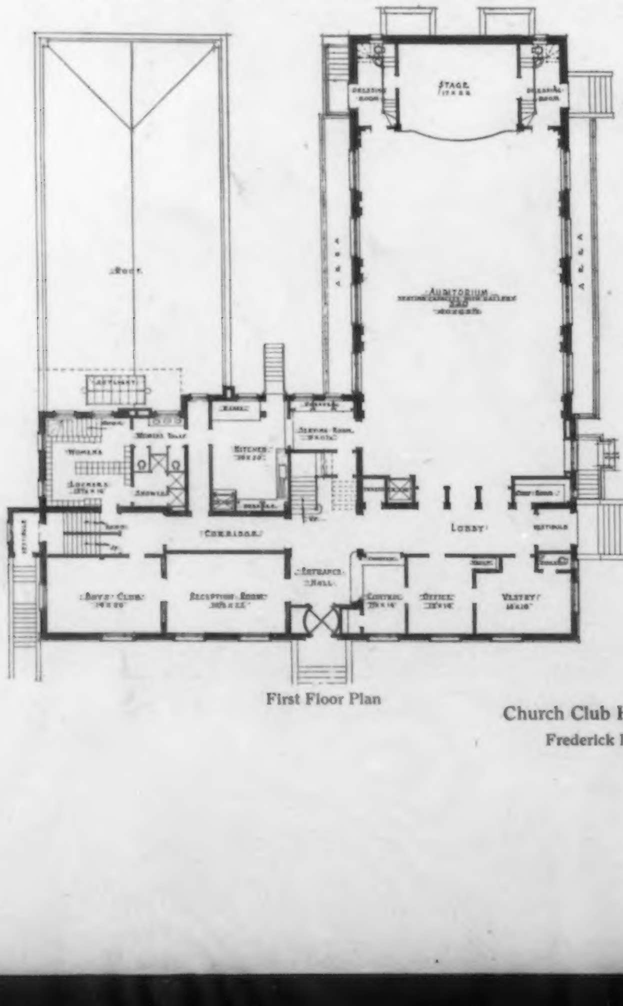
From the front of the building one comes through the main entrance into the main corridor, which gives easy access to the offices, reception room, and boys' club room. The women's lockers are on this floor and are connected by a stairway with the swimming pool below, thus making it possible to use the pool for men or women independently as desired.

The second floor is taken up largely with the upper part of the auditorium and the gallery. Several rooms are provided for the use of committees and organizations and a special room for the men's club. Again a dumb waiter connects this floor with the kitchen and makes it possible for the women's or girls' organizations to use their own rooms for gatherings where refreshments can be served.

The interior is simple and direct in its general finish. A good deal of character has been given to the auditorium by a simple use of plaster pilasters and paneled ceiling and a wainscoting of fumed oak, which is carried around the room at the height of the bases of the pilasters.

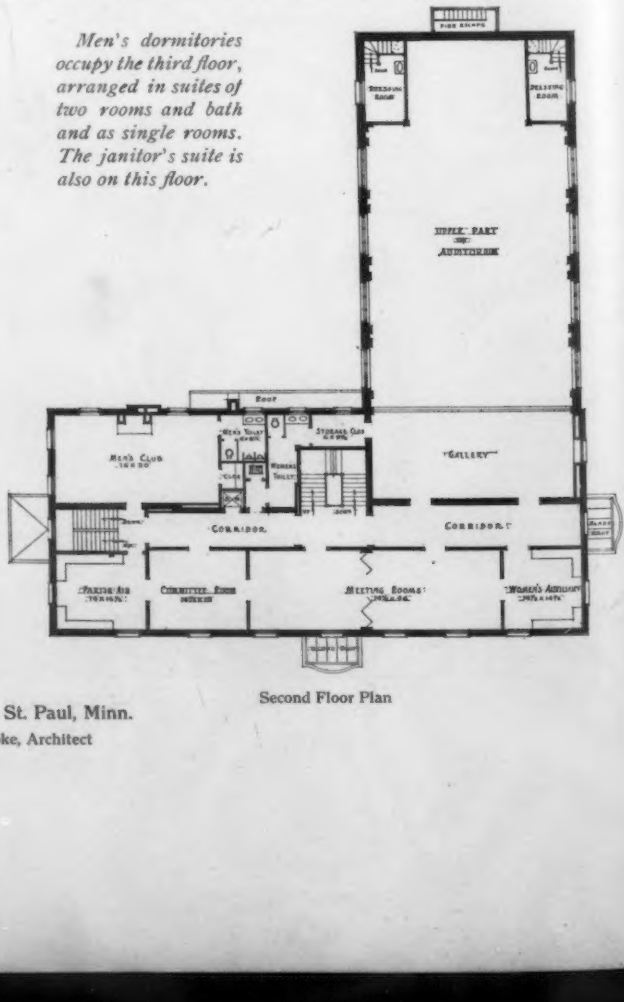
The exterior is of brick with granite basement story and marble trimmings. Considerable interest is given to the brickwork by the use of panels of patterns and spots of marble inserts. Iron marquises mark the principal entrances.

The façades express the plans in a logical manner. The large windows of the auditorium form a unit of composition which is differentiated from the rest of the building by a slight break in the wall. The importance of the first floor is echoed in the window treatment of brick arches filled with brick patterns. By treating the wall surfaces between the windows of the third floor with brick patterns, and by projecting a brick belt course just below the sill line, a frieze has been formed which caps the other two stories and at the same time expresses the different character of the dormitory floor. The widely projecting cornice and tile roof add to this subordination of the third floor and complete the composition in a satisfying manner.



First Floor Plan

Men's dormitories occupy the third floor, arranged in suites of two rooms and bath and as single rooms. The janitor's suite is also on this floor.



Second Floor Plan

Church Club House, St. Paul, Minn.

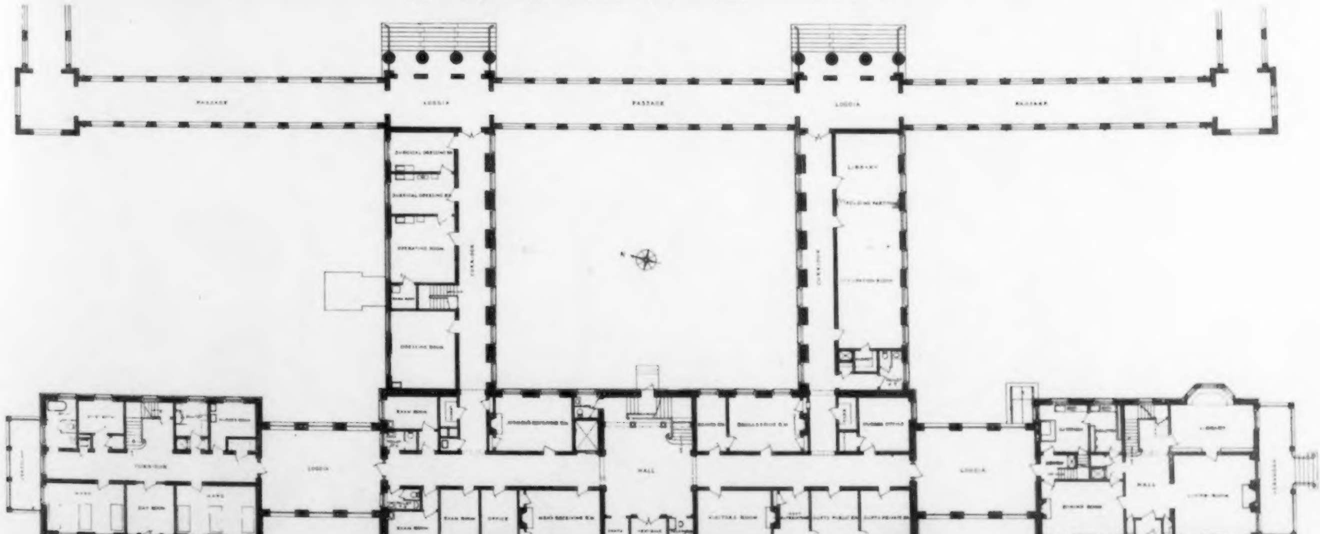
Frederick H. Brooke, Architect

ADMINISTRATION BUILDING FROM THE SOUTHWEST

WINIFRED MASTERSON BURKE RELIEF FOUNDATION, WHITE PLAINS, N. Y.

McKIM, MEAD & WHITE, ARCHITECTS

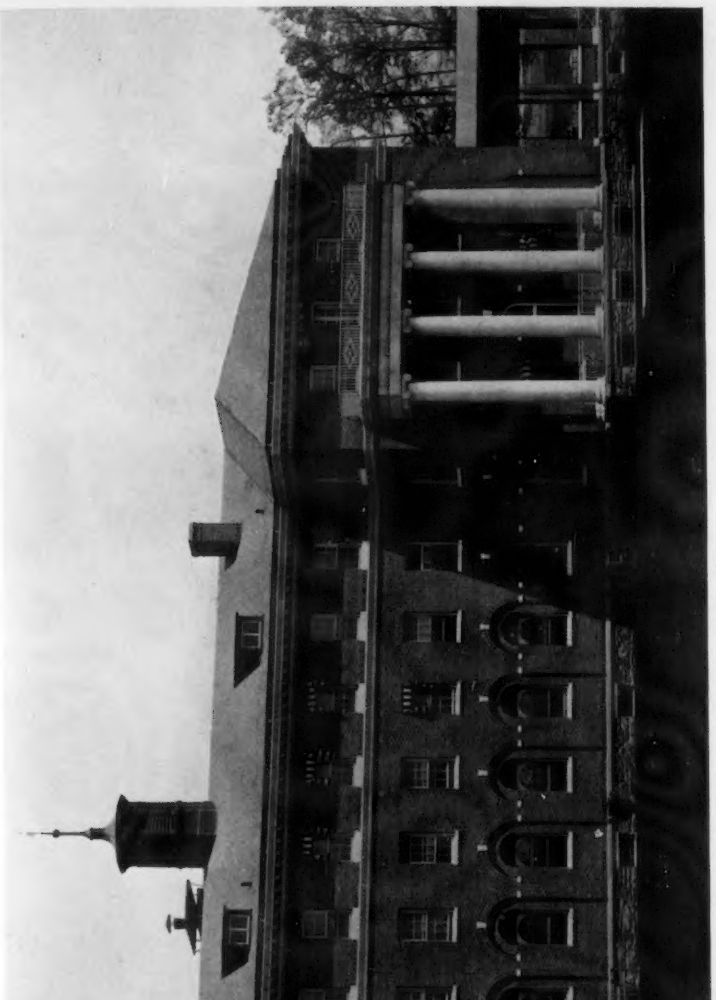
QUADRANGLE FACADE OF ADMINISTRATION BUILDING



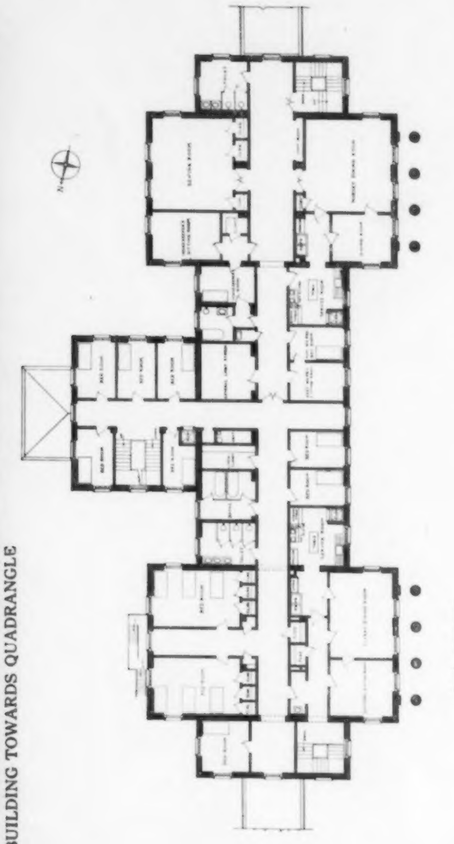
FIRST FLOOR PLAN OF ADMINISTRATION GROUP

WINIFRED MASTERSON BURKE RELIEF FOUNDATION, WHITE PLAINS, N. Y.

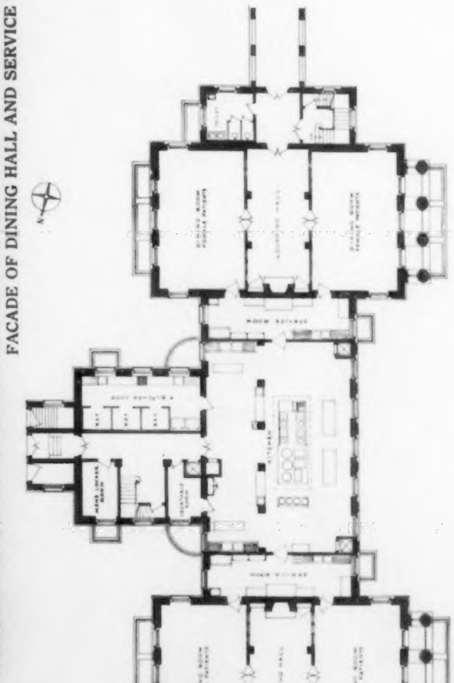
McKIM, MEAD & WHITE, ARCHITECTS



FACADE OF DINING HALL AND SERVICE BUILDING TOWARDS QUADRANGLE



SECOND FLOOR PLAN

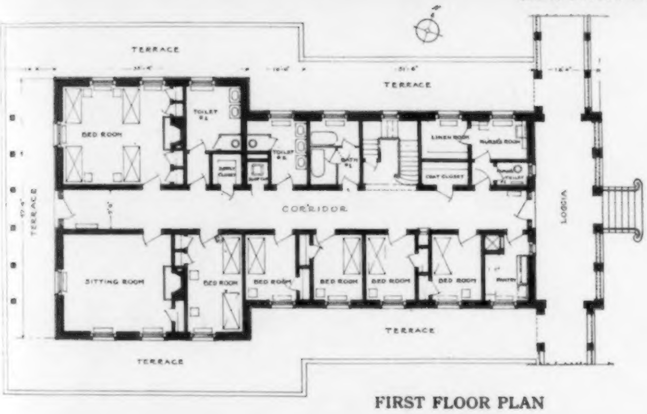


FIRST FLOOR PLAN

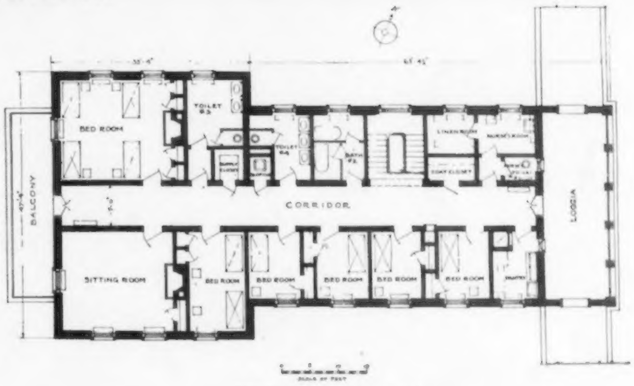
WINIFRED MASTERSON BURKE RELIEF FOUNDATION, WHITE PLAINS, N. Y.

McKIM, MEAD & WHITE, ARCHITECTS

VIEW FROM THE SOUTHWEST



FIRST FLOOR PLAN



SECOND FLOOR PLAN

GROUP OF TYPICAL PATIENTS COTTAGES FROM QUADRANGLE

WINIFRED MASTERSON BURKE RELIEF FOUNDATION, WHITE PLAINS, N. Y.

McKIM, MEAD & WHITE, ARCHITECTS

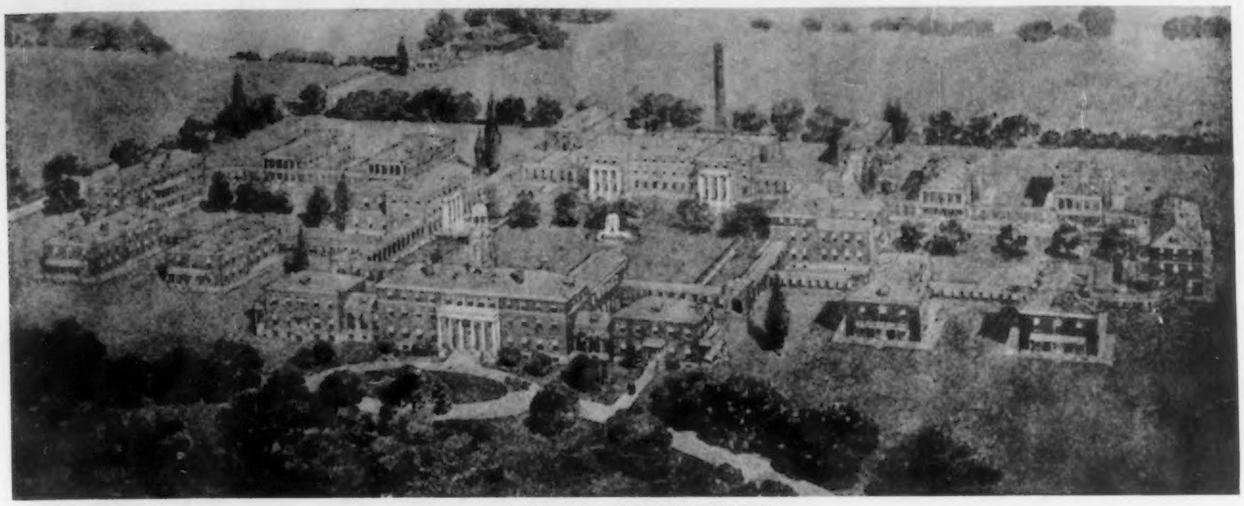
VIEW OF STABLE AND GARAGE FROM THE SOUTH

SECOND FLOOR PLAN

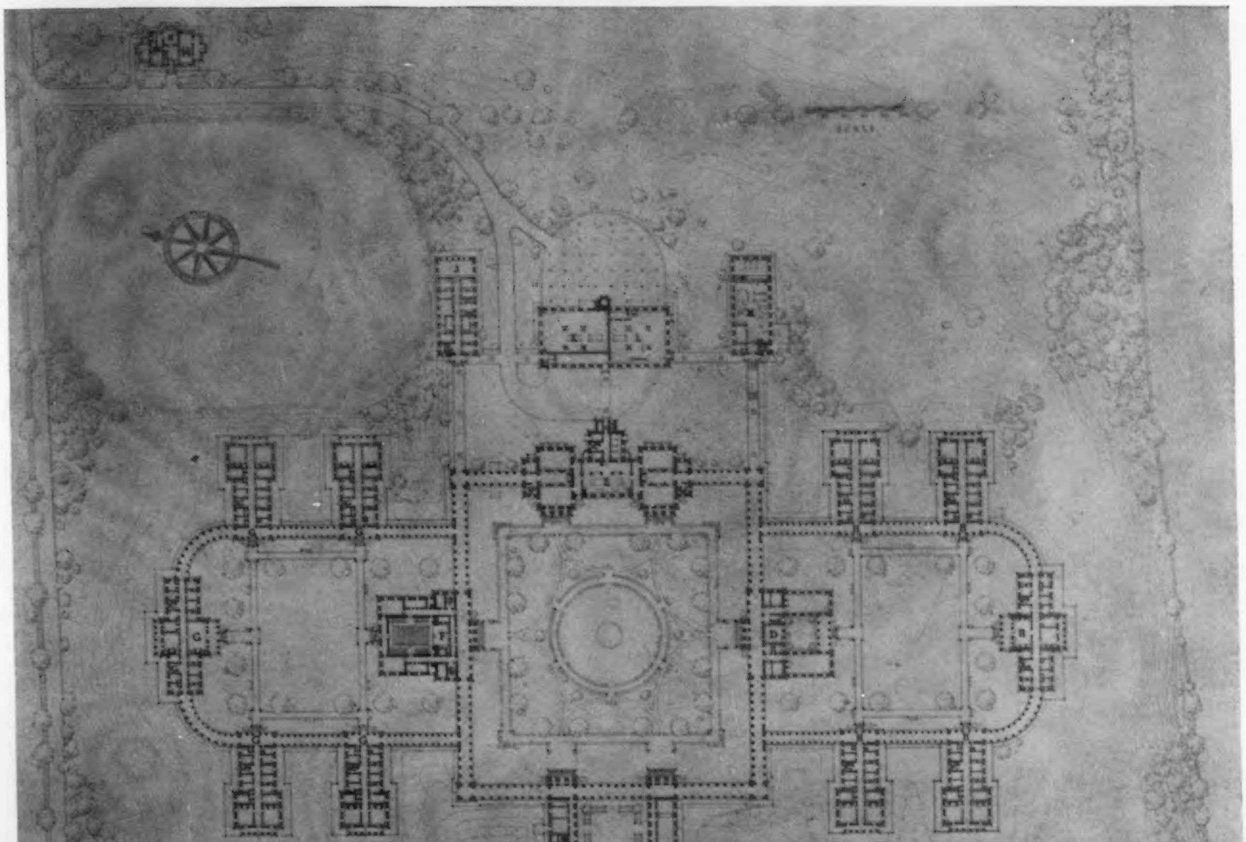
FIRST FLOOR PLAN

WINIFRED MASTERSON BURKE RELIEF FOUNDATION, WHITE PLAINS, N. Y.

McKIM, MEAD & WHITE, ARCHITECTS



BIRD'S-EYE PERSPECTIVE VIEW



GROUP PLAN

A HOSPITAL
B ADMINISTRATION BUILDING
C SUPERINTENDENT'S HOUSE
D NURSES' HOME
E DINING HALL AND SERVICE BUILDING
F ASSEMBLY HALL
G MALE PATIENTS' COTTAGES
H FEMALE PATIENTS' COTTAGES
J ISOLATION BUILDING
K BOILER ROOM
L ENGINE ROOM
M LAUNDRY
N OVERSEERS' HOUSE

WINIFRED MASTERSON BURKE RELIEF FOUNDATION, WHITE PLAINS, N. Y.

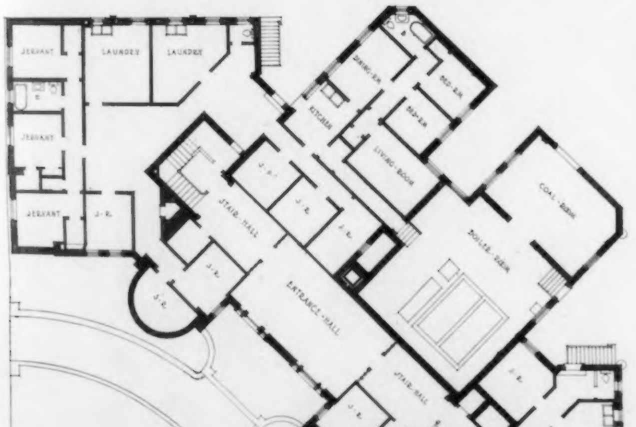
McKIM, MEAD & WHITE, ARCHITECTS

DETAIL OF PRINCIPAL FACADE

CRAIG APARTMENTS, 58TH STREET AND MONROE AVENUE, CHICAGO, ILL.

RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS

GENERAL VIEW OF THE PRINCIPAL FACADE



BASEMENT FLOOR PLAN

FIRST FLOOR PLAN

CRAIG APARTMENTS, 58TH STREET AND MONROE AVENUE, CHICAGO, ILL.

RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS

GENERAL VIEW

VIEW OF OPEN COURT

APARTMENT HOUSE, NORTH STREET, BUFFALO, N. Y.

GREEN & WICKS, ARCHITECTS

THIRD FLOOR PLAN

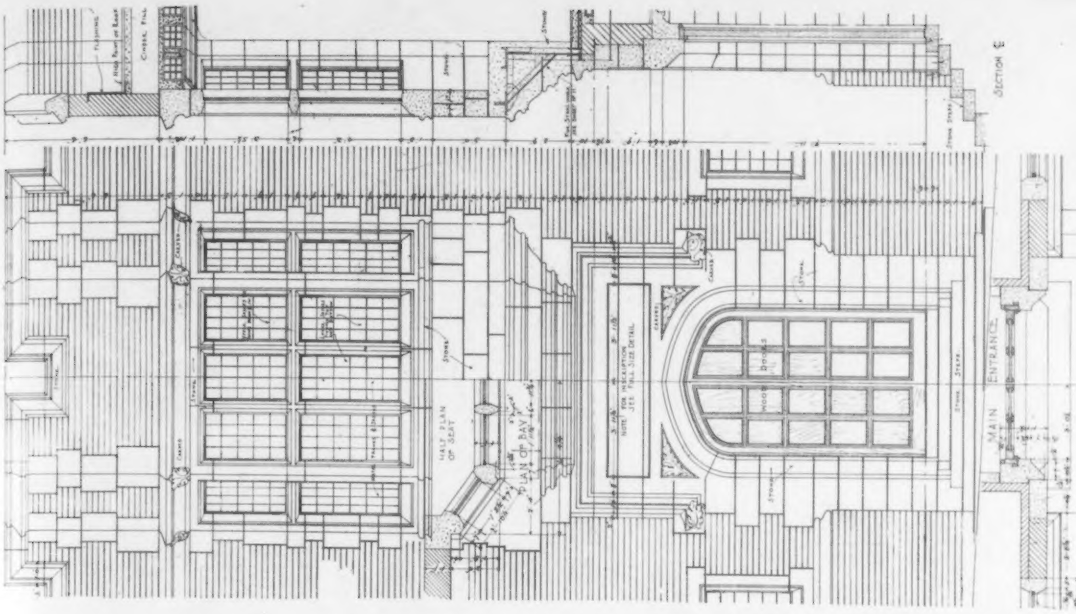
SECOND FLOOR PLAN

FIRST FLOOR PLAN

DETAIL OF NORTH STREET ENTRANCE

APARTMENT HOUSE, NORTH STREET, BUFFALO, N. Y.

GREEN & WICKS, ARCHITECTS



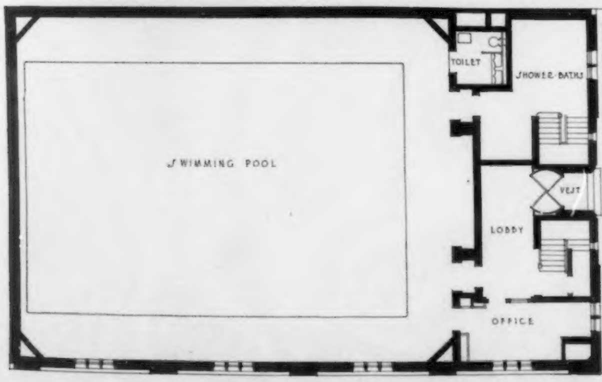
DETAIL OF ENTRANCE AND BAY

PRINCIPAL FACADE

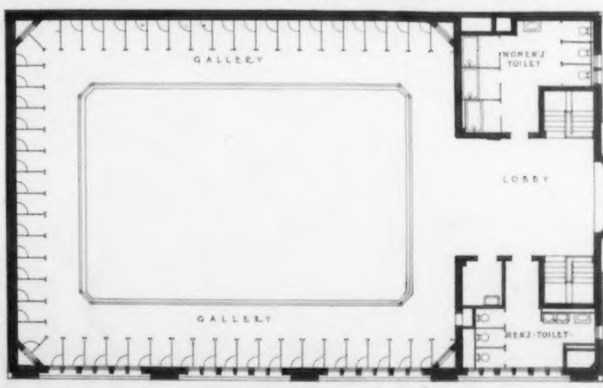
SOUTH SIDE BATH HOUSE, PITTSBURGH, PA.

MacCLURE & SPAHR, ARCHITECTS

SWIMMING POOL



FIRST FLOOR PLAN



SECOND FLOOR PLAN

SOUTH SIDE BATH HOUSE, PITTSBURGH, PA.

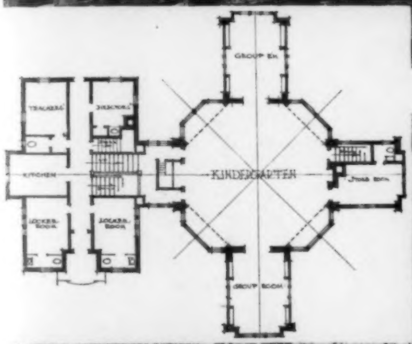
MacCLURE & SPAHR, ARCHITECTS

DETAIL OF GROUP ROOM WING

DOWNERS GROVE KINDERGARTEN, DOWNERS GROVE, ILL.

PERKINS, FELLOWS & HAMILTON, ARCHITECTS

VIEW SHOWING ENTRANCE



GENERAL VIEW

DOWNERS GROVE KINDERGARTEN, DOWNERS GROVE, ILL.

PERKINS, FELLOWS & HAMILTON, ARCHITECTS

TWO VIEWS IN CENTRAL KINDERGARTEN ROOM

VIEW OF A GROUP ROOM

DOWNERS GROVE KINDERGARTEN, DOWNERS GROVE, ILL.

PERKINS, FELLOWS & HAMILTON, ARCHITECTS

Plumbing Installation and Sewage Disposal.

IV. MECHANICAL APPLIANCES USED IN PLUMBING SYSTEMS AND THE GENERAL PRINCIPLES OF SEWAGE DISPOSAL.

By CHARLES A. WHITTEMORE.

IT IS sometimes necessary in the case of high buildings, when the city water pressure is quite low, to establish a forced circulation of either hot or cold water. To accomplish this end, pumps of various types are installed in the system so that the water coming from the service mains is either forced directly through the plumbing system or lifted to a suitable tank and from this point distributed by gravity to the various fixtures. The latter method is usually preferable in that it maintains an ample reservoir and supply of water in case of accident to the pumping plant. The water is kept at a constant pressure and the pulsations of pump action are not so noticeable.

Recently the opposition to maintain large volumes of water in tanks above the roof has assumed proportions demanding consideration. It is obviously a potential menace, and for this reason a pumping system which can do away with the overhead tanks is desirable.

The type of pump is determined largely by the duty imposed upon it and ranges from the steam turbines or electrically driven pumps to the smaller inspirator types. In the steam turbines a capacity of many thousand gallons a minute can be obtained and pressure made to suit the conditions.

It is hard, therefore, to lay down an established rule to determine the character of a pump for a special condition. The architect should decide this matter by making a personal investigation into the individual requirements of each case. In some cases an electrically driven pump of a smaller size would be perfectly suitable. In other cases a small, water force pump will give the requisite service. In large buildings where a power plant is operated, a steam driven pump can be operated at a low cost. Obviously it would be impossible to operate a steam pump from a low pressure system unless the demand on the pump is small. Electrically driven pumps in the majority of cases are operated at less expense and at a lower repair and maintenance cost.

In the handling of sewage the conditions are of such a different character that the problem of pump installation becomes almost a special study. Many of the large buildings,— hotels, theaters, etc.,— in order to develop suitable space below the street level, require plumbing equipment installed at a point below the normal grade of the sewer in the street. In such cases pumps of a special nature must be installed to raise the sewage from the low point of the system to the main sewer. This is usually accomplished by an arrangement of pumping or lifting devices known as an "ejector."

In connecting ejectors of any type into a system, particular care should be taken that the soil and plumbing lines, on which the ejector is connected, should be vented separately through the roof, and also that the connection from the ejector should be made on the sewer side of the house trap, if a house trap is installed.

Ejectors may be divided into two types, — the air compressor type and the centrifugal pump type. In the type in which an air compressor is used, the drains and soil pipes all deliver into a tight iron tank from which the outlet extends to the level of the sewer. In this tank is installed a float which, upon reaching a certain fixed point, due to the rise of material in the tank, opens a relief valve and allows the compressed air to enter the tank compartment. The force of this air pressure blows out all of the material from this compartment into the sewer. Check valves are installed on the various inlet pipes to prevent the air pressure from forcing the contents of the tank backward into the main soil pipes in the building, and a check valve also is placed on the discharge pipe to prevent any return flow from the discharge pipe into the tank after the air pressure has been stopped. In connection with this type of installation, it is necessary to install an air tank, in which the air may be maintained at a constant pressure; the pumps to maintain this pressure and to supply compressed air after each discharge of the apparatus. In this particular type a stage of perfection has been reached which is highly desirable in mechanical appliances of this kind, and after an installation has been completed it requires very little care and attention.

The centrifugal type of sewage ejector consists of a tank, or receptor, into which the sewage is discharged from the fixtures. A float, rising under the influence of the water in the tank, operates a starting switch which, in turn, actuates the motor; this motor, driving a centrifugal pump, raises the water from the tank level to the level of the street. These pumps are designed in various sizes to suit the lift of the water — that is, the distance from the tank to the street sewer — and are made in single and duplex units.

The simplest form of centrifugal pump is frequently called a bilge pump and consists merely of the motor, the centrifugal pump itself, and the tank cover. In an installation of this kind the tank is frequently a cement pit over which a tight cover is placed and a motor mounted upon it.

In the duplex unit, in which there are two pumps and two motors, the motors themselves are placed above the cover in the same manner as in a single unit, but the pumps are mounted outside of the iron casing in an open space which is accessible and available for use to carry off surface water or to act as a cellar drainer. This type is far superior to the single unit type and is more easily cleaned and operates at a low cost.

In either the compressed air or the centrifugal type the time consumed in discharging the normal tank is about 50 seconds, and represents a capacity of approximately 100 gallons.

Cellar drainers are devices usually installed in connection with a boiler room or a particularly low portion of the

basement to care for the draining of the cellar floor, or as an insurance against damage due to leakage from the outside. Frequently an apparatus of this sort is installed at a point where water enters the cellar through the walls and where the expense of waterproofing would be prohibitive.

The general type of cellar drainer consists of a small strainer, a float, an inspirator valve, and a discharge pipe. These cellar drainers are usually mounted in a sump pit which may be either of concrete, earthen ware, or iron, and which should have a strainer cover. The water rising in the sump pit raises the float, which in turn opens the inspirator valve and allows the water pressure to flow directly by the mouth of discharge pipe from the cellar drainer; and, by the same principle as the atomizer principle, the water is drawn from the sump pipe up through the discharge pipe. The float, receding as the water is discharged, automatically cuts off the water pressure. In buildings where the water is measured by a meter, the actual operating expense incurred in an installation of this kind is only when the float has reached its highest stage and is on the descent; this expense is small.

Cellar drainers are adapted only to conditions where the water cared for is small in quantity and where the actual operation of the drainer is likely to be intermittent. The maximum capacity of this type with an ordinary street pressure of 60 pounds is approximately 1,000 gallons per hour. In cases where a more serious influx of water must be opposed, a pump similar to an ejector pump should be installed.

The installation of a cellar drainer many times is more in the nature of an insurance against damage from water than because of the actual present need. These drainers operate under a very low street pressure, and the cost of maintenance is merely the amount of water passing through the inspirator valves while they are actually performing some service.

Sewage Disposal. Sewage disposal in its broadest sense applies to towns and cities more than to individual installations, but many large estates and country houses have disposal systems of their own, and it is in these that we are interested. No attempt will be made to discuss the scientific nature of the question, but an outline of various methods will be given in order to show the principal characteristics of each type. The whole subject is technical and demands scientific training along specialized lines. In the course of ordinary architectural practice the problem of sewage disposal is seldom encountered. It is, therefore, of importance to secure the services of a trained sanitary engineer in order to be certain of the best results.

There are three general divisions under which the subject of sewage disposal may be considered: first, the filter beds; second, the bacterial system; and third, mechanical filters.

In the first type the sewage, after having been collected in proper tanks and having passed through sedimentation or settling tanks, is forced by pumps to the surface of the filter beds, which are usually composed of a mixture of sand and ordinary earth. The filter beds are usually large areas of land taken in an undeveloped section of the city or town or estate, and are arranged in the form of depressions at varying levels. The supply pipe from the pumping plant or the drain pipe from the ordinary sewerage system delivers the material into the first filtration bed, which, by a system of trenches or overflow pipes, connects through the remaining portion of the system, and as soon as one bed is filled to the proper level the next filtration bed is filled.

By a system of valves these beds may be made in relays so that one complete unit of several beds may be filled up and another one brought into use while the first is actually filtering the material deposited. In this manner the waste matter is all cared for by being absorbed in the earth and by the natural action of the nitrifying bacteria.

The disadvantage of this system is principally due to the fact that it requires a large amount of area for the filter beds, and that after being used for some time the earth becomes thoroughly clogged and slow in action. Filter beds of this general character may be seen at Framingham, Mass., where for some little time they have been in operation.

In the bacterial type of sewage disposal systems the sewage is conducted to a tank which is tightly closed and in which certain bacteria are colonized. The action of the bacteria on the waste matter is such that the discharge from the tank is a clear liquid. This effluent has many times been carefully tested, and is found, after having passed through the process of septic tanks, to contain no bacteria or germs of dangerous character, so that the discharge from a system of this nature may be connected directly to an open stream or river. It has also been demonstrated that animal life may be sustained in the discharge from this type of system.

The advocates of this type claim for it many advantages over any other system in existence, but in large installations it is quite essential to have a trained scientist to keep a system of this type in good working order.

The third type, or mechanical filtration, is that type in which sedimentation tanks are used, the filling of these tanks being accomplished either by gravity or by pumps, and the product passing from one sedimentation tank to another until the effluent is practically free from all possibilities of contamination. Sedimentation tanks of this nature require more attention than do the other systems noted, and this system is subjected to the still further disadvantage that the materials filtered must be cared for after the process of filtration is completed.

Many of the smaller cities and towns throughout the country have no general system of sewers to take care of the flow from the house drains of the independent buildings. The necessity therefore arises for providing some means of disposal of the waste matter in each installation where sewers are not available. There are various ways in which this may be accomplished, such as by means of leeching cesspools, syphon cesspools, vaults, or a direct discharge to a river or the sea.

Where any of the above systems are adopted it is of vital importance that the pipes conducting the waste matter to the disposal point shall be of a proper size and shall be properly laid.

It is an established fact that more difficulty arises from the use of pipes which are too large in size than from pipes of a smaller internal diameter. The velocity of flow in a small pipe is greater with a given pressure than a larger pipe. It is, therefore, obvious that the danger of clogging in large pipes is more to be considered than in pipes of smaller size.

It would be absurd to attempt to establish the exact dimensions for the main connection from the house drain to the sewer or to the cesspool for each installation, but as a general rule a 4-inch pipe will be sufficiently large for the average house, a 6-inch pipe for a residence of larger proportion, and an 8-inch pipe for an ordinary city building. Different conditions occurring in each installation may change the sizes of these pipes, but the above dimensions are the nearest that can be established arbitrarily.

These pipes should pitch, if possible, ¼ inch to the foot, but never less than ⅛ inch to the foot.

From a point 10 feet beyond the wall, to which point the iron house drain is built, the pipe can be of tile to advantage. The tile pipe should, however, as has been previously noted, be smooth inside and thoroughly glazed, and, where this drain leads to the cesspool or other disposal system, the joints between the main house drain and the tile pipe and the joints in the tile pipe itself should all be made with particular care to be both water and gas tight.

A defective joint in a pipe of this character would readily permit of the waste matter in the pipes escaping into the surrounding soil, and, by following the different strata of the ground, eventually reaching a well or cistern from which water may be drawn for drinking purposes, and thus afford an easy vehicle for the spread of disease. It also causes a certain pollution of the ground in the vicinity of the pipe, and is likely to create disagreeable odors.

The leeching cesspool is one of the worst possible methods of sewage disposal. It is constructed ordinarily of walls laid up dry, the house drain being extended directly into the chamber. The liquids in the cesspool are supposed to pass off through the walls into the surrounding ground and be disposed of in this manner without objectionable features. The fact remains, however, that within a short time the apertures in the walls speedily become clogged, and this causes either overflow of the cesspool, or, if the cesspool is sufficiently large to retain a considerable supply of material, it affords an excellent breeding place for bacteria. A cesspool of this character should be properly cleaned at frequent intervals.

A syphon cesspool consists of two cesspools at a distance from each other, in one of which the house drain discharges directly. A pipe connecting the two cesspools extends towards the bottom of the first cesspool and discharges with an open end into the second, the theory being that the rise of water, or liquids, in the first cesspool will, by syphoning action, produce a flow into the second cesspool. The liquids will then readily pass off through the walls without clogging the openings. The first cesspool is, therefore, merely the depository of the solid matter, which can be readily cleaned.

Mention has previously been made of the system of surface disposal by filter beds, which system has been advantageously used in many installations. This is not desirable, however, in small installations, such as we are now considering. There is a method closely allied to this which in the smaller installations is frequently adopted, and which is far better than either of the cesspools noted above. This is the system of "under the surface" irrigation.

In a system of this character the waste matter from the main house drain is conducted into a tightly closed cesspool, and from this cesspool porous terra cotta drains are laid to whatever place is determined upon as the subsurface irrigation field. In this field lines of porous terra cotta pipe are laid, and are all connected to the main discharge pipe from the cesspool. At intervals a gate valve, controlling this main discharge pipe, is opened and the material in the cesspool is allowed to flow through the porous pipes. By this means the water percolates through the pipes and is absorbed in the surrounding ground. The solid particles which are carried through the pipe are deposited at various points at the end of the pipes and are speedily oxidized by the action of the earth and air.

A system of this kind is very valuable and requires but little attention, but in order to be of the maximum efficiency the gate valve should be opened and closed at regular stated intervals.

The difference between an installation in which the flow in the pipes is intermittent and one in which the flow is constant, is the difference between an efficient discharge and a disposal system full of potential trouble.

The question will be raised as to what is the difference between the system of sub-surface irrigation and a leeching cesspool, but the answer upon examination is perfectly obvious. In sub-surface irrigation a very small portion of the material to be absorbed by the earth is deposited in any one place. In the leeching cesspools the amount of material to be absorbed is so much larger in proportion that the earth with which it comes in contact becomes clogged and unabsorbent.

The location of the cesspool and of sub-surface irrigation fields should be carefully considered in laying out the work. The nature of the soil in each independent installation may be of such different character that in the installation of cesspools the material passing off through the walls into the surrounding ground may be carried to a greater distance than anticipated and pollute wells or cisterns which are first thought to be beyond the range of contamination.

In order to be absolutely sure that an effect of this kind cannot take place, it is advisable to dig a test pit the depth of the proposed cesspool, in order to determine exactly the conformation of the sub-soil strata. This will immediately determine in which direction the liquids will be most likely to distribute after coming in contact with the earth outside of the cesspool.

In any event it is wise to maintain cesspools as far away from the house and as far away from a well as the conditions of the property will permit. It is not wise to establish the locations or the details of a disposal plant, even of such small comparative size as is required under the conditions noted above, without as thorough and complete knowledge of the conditions of the property, the character of the soil, and the location of any waterways which may be in the vicinity as it is possible to obtain.

FLOOR PLANS OF HOUSE SHOWN BELOW

GENERAL VIEW

FLOOR PLANS OF HOUSE SHOWN BELOW

TWO SMALL HOUSES AT ERIE, PA.

FRANK B. MEADE, ARCHITECT

Design and Construction of Roof and Wall Trusses.

V. THE HAMMER BEAM AND SCISSORS TYPES OF TRUSSES. (Concluding paper.)

By MALVERD A. HOWE, C.E.

Director Architectural and Civil Engineering Departments, Rose Polytechnic Institute.

THE skeleton frame of a typical hammer beam truss is shown in Fig. 103. The introduction of other pieces in the frame merely adds to the stiffness of the structure, the principal work of carrying stresses being performed by the members shown.

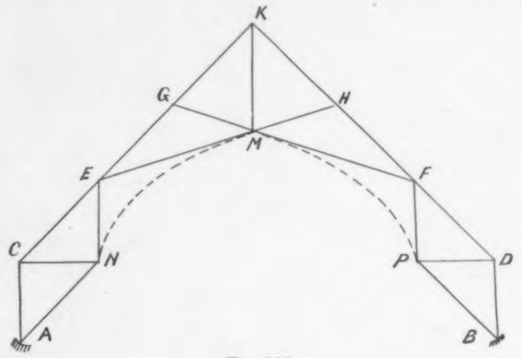


Fig. 103

The behavior of this truss under loading is very similar to that of the "A" truss, and therefore for spans for which it is generally used it is not feasible to construct the truss on supports which are unable to take care of the horizontal thrusts.

In the following analysis of the stresses it will be assumed that the supporting points A and B remain unchanged in their relative positions and that there are no bending moments at these points. If now the assumption is made that there are no bending moments at the joints E and F, the directions of the reactions at A and B become fixed. The left reaction will pass through A and E, and the right reaction through B and F. Any loading below E and F is assumed to be transferred by rafters to the wall and the purlins resting at E and F. *These assumptions can be used only for symmetrical loading.* Fig. 104a shows the stress diagram for the truss and loading shown in Fig. 104. The horizontal thrust at A and B (Fig. 104) equals MK as scaled from Fig. 104a. It is evident that this thrust becomes smaller and smaller as the vertical distance between A and E increases.

For unsymmetrical loading the connections at E and F cannot be assumed as pinned. Following the method pursued in the consideration of the "A" truss, the horizontal thrust for an unsymmetrical vertical loading is assumed to be one-half that for twice the loading symmetrically placed. The magnitude of this thrust is found by constructing a figure similar to Fig. 104a and taking one-half of MK as found.

For an unsymmetrical horizontal loading the horizontal thrust at each support is assumed to be one-half the total horizontal loading.

The vertical reactions for an unsymmetrical loading are the same as for any simple truss on two supports.

The outside forces acting on the truss are now fully determined. The direct stresses in the truss members can be found by the method of moments.

The maximum bending moments in the rafters occur at E and F, and, if the rafters are not sufficiently strong to carry these moments and such direct stresses as may occur, they must be reinforced by extra timbers, or by knee braces, which are usually curved. It is better practice not to place any dependence upon knee braces or curved struts.

To illustrate the method by an example, take the truss shown in Fig. 105. The truss has a span of 60 feet, a rise of 40 feet, and supports purlins at E, G, K, H, and F. If the trusses are spaced about 15 feet on centers, the

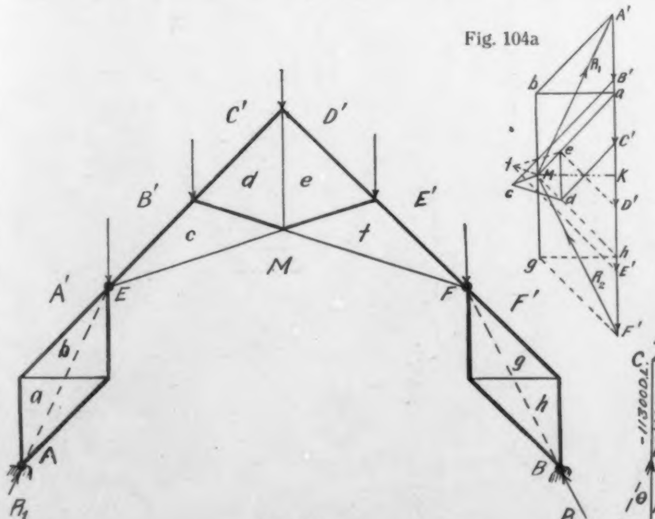


Fig. 104

Fig. 104a

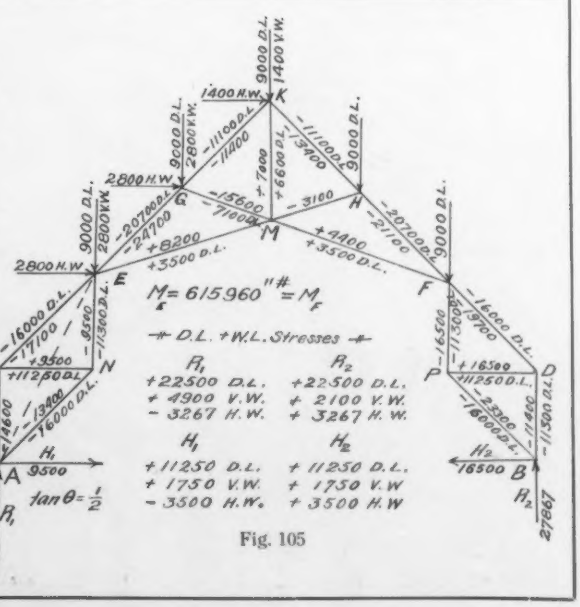


Fig. 105

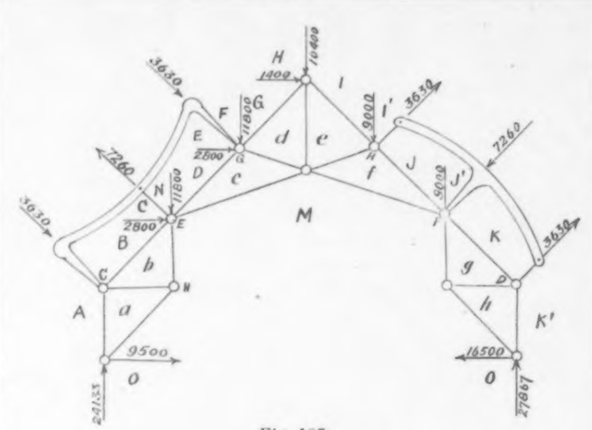


Fig. 105a

dead load at each apex will be about 9,000 pounds and the wind load about 4,000 pounds. For the wind load, 2,800 pounds will be taken for both the vertical and horizontal components.

Considering the dead load alone, the vertical reaction at each support is equal to one-half the total load, or 22,500 pounds. Under the assumption that the directions of the reactions shall pass through A and E on the left and B and F on the right, the horizontal thrust at each support equals 22,500 tan $\theta = 11{,}250$ pounds.

For the vertical components of the wind forces, the vertical reactions are quickly found by moments,

$$R_1 (60) = 2{,}800 (50 + 40) + 1{,}400 (30)$$

or $R_1 = 4{,}900$ pounds and $R_2 = 7{,}000 - 4{,}900 = 2{,}100$ pounds.

To determine the horizontal thrusts due to the vertical components of the wind forces, place an equal number of equal and symmetrical loads on the truss. Then the vertical reaction at each support is 7,000 pounds and the corresponding horizontal thrust is 7,000 tan $\theta = 3{,}500$ pounds. Since one-half of the loading produces one-half the thrust, the true horizontal thrust produced by the vertical components of the wind forces is 1,750 pounds at each support. These act in the same directions as the thrusts produced by the dead load.

The vertical reactions produced by the horizontal components of the wind loads are found by moments,

$$R_1 (60) = 2{,}800 (20 + 30) + 1{,}400 (40),$$

or $R_1 = 3{,}267$ pounds acting *downward* and $R_2 = 3{,}267$ pounds acting *upward*.

According to assumption, the horizontal thrusts are each equal to one-half the total horizontal load, or 3,500 pounds, and both act from the right towards the left.

The final reactions at each support are shown in Fig. 105.

The bending moments at E and F are produced by the wind forces alone, and each equals

$$1{,}633 (10) + 1{,}750 (20) = 51{,}330 \text{ foot-pounds,}$$

or 616,000 inch-pounds.

The direct stresses in the truss members can be found by graphical methods or by moments. In either method, however, the effect of the bending moments in the rafters must be considered. This can be done by assuming that all joints of the truss are pin connected and that the bending moments are taken by auxiliary beams, as shown in Fig. 105a.

Taking the auxiliary beam on the left, let it be supported at joints C and G and from its center assume a cable running to the joint E. Now assume that the cable is shortened until the center of the auxiliary beam is subjected to a bending moment of 51,330 foot-pounds, the rafter bending moment. Then, evidently, the effect of this bending moment upon the truss is equivalent to applying a force of 3,630 pounds acting downward at joints C and G, and a force of 7,260 pounds acting upward at E, as indicated in Fig. 105a. In a like manner the effect of the rafter moment on the right is found as indicated in the figure. The auxiliary beams can now be removed, leaving the forces just found acting upon the truss, and the stresses found in the various members of the truss by drawing the usual stress diagram as shown in Fig. 105b.

If the method of moments is used, the stresses are found in the manner illustrated below.

The stress in CE is found by taking a section cutting the pieces CE and EN (Fig. 105c) and using the point N as a center of moments. The moment force 3,630 pounds found from Fig. 105a must be introduced at joint C.

From Fig. 105c, stress CE (7.07) = 24,133 (10) — 9,500 (10) — 3,630 (7.07), or stress CE = 17,100 pounds com-

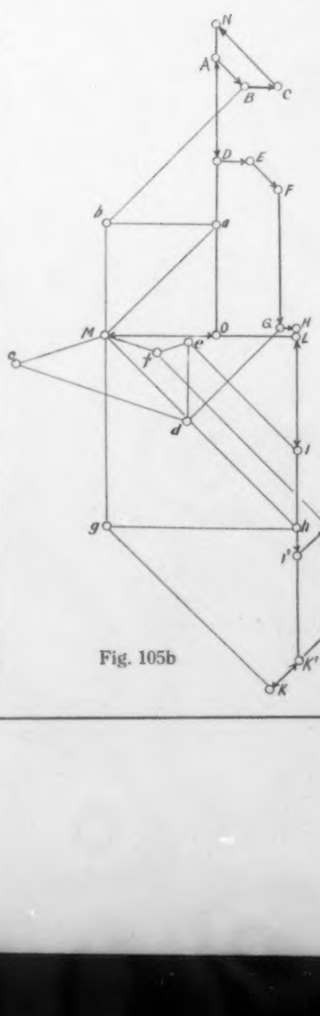


Fig. 105b

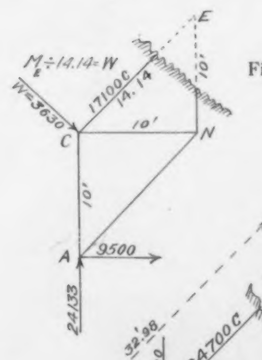


Fig. 105c

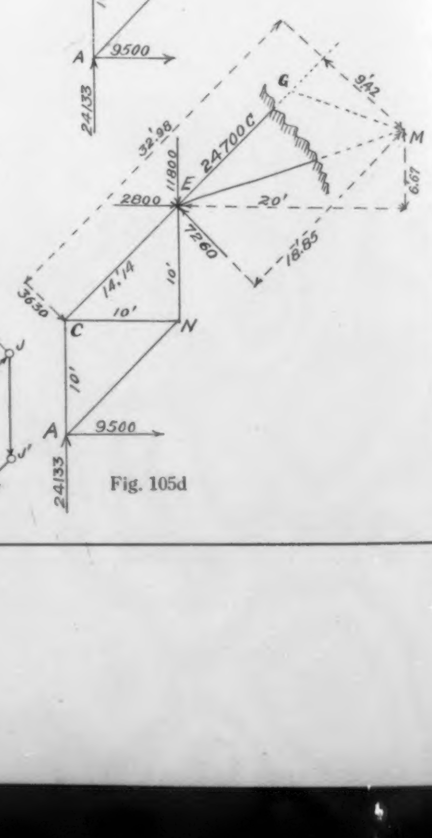


Fig. 105d

pression. In a similar manner the compression in FD is found to be 19,700 pounds.

From Fig. 105d, stress GE (9.42) = 24,133 (30) — 9,500 (26.67) — 2,800 (6.67) — 11,800 (20) — 3,630 (32.98) + 7,260 (18.85), or stress GE = 24,700 pounds compression. In a similar manner the compression in HF is found to be 21,100 pounds.

The magnitudes of these stresses show that the direct stresses may be neglected in proportioning the rafters at points E and F, and only the bending moments considered.

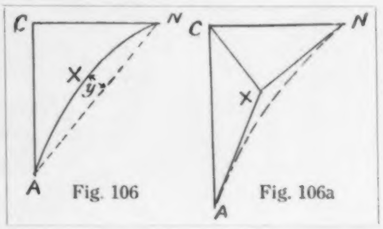


Fig. 106 Fig. 106a

Since the bending moments are produced by the wind loads alone, and since these will have a maximum effect only at long intervals, it is permissible to use a fiber stress of at least 1,800 or 2,000 pounds per square inch. Using 1,800 pounds, the section modulus required at E is

$$616{,}000/1{,}800 = 342.2.$$

The nearest commercial size which can be used is a timber 12 by 14 inches (actual size 11½ by 13½ inches). Including a direct compression of 22,900 pounds, the maximum unit stress at E is about 1,900 pounds per square inch. Since some cutting of the rafter will be necessary in connecting the members NE and EM, it will be advisable to use a timber 12 by 16 inches for the rafter, which should be continuous from C to G.

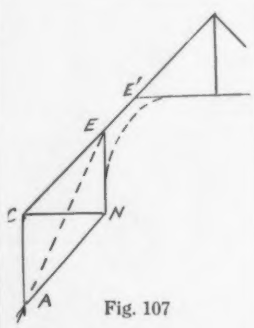


Fig. 107

The member AN is usually curved, and, therefore, must resist not only the direct stress as found when it is straight, but in addition it must be capable of resisting the cross-bending stresses due to its shape. For all practical purposes the following method is sufficiently exact for dimensioning such members.

In Fig. 106, let y represent the middle ordinate of the center line of the curved member and R the stress along the line AN. Then the maximum unit stress in the curved piece must not exceed the allowable unit stress in the piece if assumed as straight. If f is the allowable unit stress, b the breadth of the piece, and d the depth measured in the direction of y, then

$$f = R(d + 6y)/bd^2,$$

or

$$d = \left\{ R + \sqrt{24Rybf + R^2} \right\} \Big/ 2bf.$$

For example, if b = 12 inches, y = 24 inches, f = 1,000 pounds per square inch, and R = 24,000 pounds, d = 18 inches.

This shows that curved members are not economical to say the least. A better arrangement is shown in Fig. 106a, where all of the pieces are straight and can be boxed to give the appearance of a curved brace.

When a curved member is used between N and M (Fig. 105) it is better to ignore it in the determination of stresses.

If the truss has the form shown in Fig. 107, the reactions may be found in the manner explained for Fig. 105, and then the stresses in the various members found by the method of moments.

The methods of analysis for the "A" truss and the hammer beam truss given above are not theoretically exact, but they permit the use of ordinary methods of calculation and lead to results which can be safely relied upon.

THE SCISSORS TRUSS.

The scissors truss, like the hammer beam truss, when on supports which are immovable, has a tendency to push the walls outward when vertical loads are placed upon it. Unlike the hammer beam truss, the members are not subjected to cross-bending stresses. Fig. 108 shows a typical form of this truss. As this truss is often used where the supporting walls are unable to resist horizontal thrusts, the truss must be so designed that the change in the length of the span, due to the changes of length of the individual members, is small. If the change in the length of the span is known, the truss can be framed this amount short of the span desired, and the truss allowed to slip on one support as the loading is placed on the truss until finally the proper span is reached. A better way, however, is to so design the truss that this horizontal deflection is very small — so small, in fact, that it can be neglected. The method of doing this will be illustrated by an example.

Let p = the stress per square inch in any member of the truss produced by a full load;

u = the stress in any member of the truss produced by a load of one pound acting at the left support, which will be assumed to be on rollers and parallel to the plane of the support, usually horizontal;

l = the length center to center of connections of any member of the truss, expressed in inches;

E = Young's modulus of elasticity for the material employed in any member of the truss;

D = the total change in length of span produced by a full load, expressed in inches;

a = the area of the cross-section of any member of the truss, expressed in square inches;

and H = the horizontal force applied at the support necessary to make D = zero, expressed in pounds.

Then $$D = \Sigma(pul/E)$$

and $$H = D/\Sigma(u^2l/aE).$$

Let the truss shown in Fig. 108 have a span of 20 feet and a rise of 10 feet, and, for convenience, let the apex loads be 1,000 pounds, as shown. Assume all members excepting the vertical to be made of white pine timbers, 6 by 6 inches, and the vertical rod to be 1 inch in diameter, upset at the ends. Young's modulus for white pine is about 1,000,000 and for steel 30,000,000. The calculations for D and H are given in tabular form on page 178. From the results of these computations it appears that

apex loads of 1,000 pounds produce a horizontal thrust of about 2,000 pounds, if the supports are immovable, or a change in length of span of 5/100 inch if one end of the truss is free to move. These results are true for very small unit stresses, as shown by the values of p in the table.

If the truss in Fig. 108 is assumed to be distant each way from other trusses, 10 feet, the actual apex loads may approach 2,500 pounds each. These will cause a horizontal thrust of about 5,000 pounds, or a change of span of about 13/100 inch. This change of span length is of no importance if the truss is permitted to slip on one support. If the truss cannot slip, then the supports must be capable of taking the horizontal thrust of 5,000 pounds.

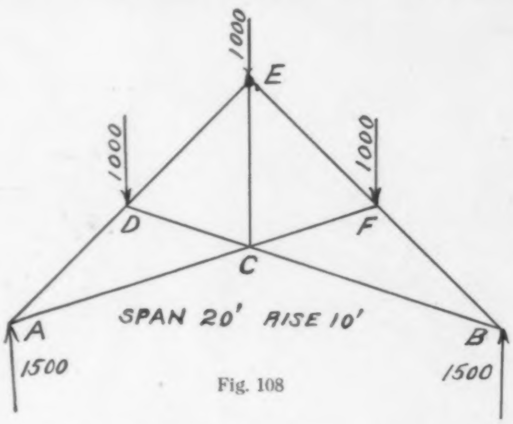


Fig. 108

The members AC and CB are responsible for over 50 per cent of the horizontal deflection and the piece CE for over 13 per cent.

If the small truss used in the example can produce such a large horizontal thrust when the unit stresses in the members are so small, it is quite evident why walls lean outward and roofs sag when scissors trusses are treated as simple trusses on two supports.

In case the span is assumed not to change and the supports resist the horizontal thrusts, the actual stresses in the truss members can be found by the usual graphical methods after the magnitudes of the thrusts have been found as explained above. These stresses are generally quite small and do not call for heavy details at the joints. However, it is best to make the connections relatively as heavy as the members connected.

When the truss is supposed to simply rest on the supports, then the details must be made heavy to avoid yielding in the connections.

With the exception of the connections over the supports, the ideas conveyed by the numerous details given for simple trusses can be used in designing the other connections.

Figs. 109, 110, and 111 show details of connections at the supports which are suitable.

COMPUTATIONS FOR D AND H.

Piece.	Stress Produced by 1,000 Lb. Loads.	a Sq. In.	p Lbs.	u Lbs.	l Ins.	$\frac{pul}{E}$	$\frac{u^2l}{aE}$
AD	−3,160	36	87.8	−0.71	84.8	.00528	.00000118
DE	−2,100	36	58.3	−0.71	84.8	.00351	.00000118
EF	−2,100	36	58.3	−0.71	84.8	.00351	.00000118
FB	−3,160	36	87.8	−0.71	84.8	.00528	.00000118
DC	− 800	36	22.2	0	63.2	0	0
AC	+2,360	36	65.5	+1.58	126.5	.01316	.00000875
CE	+1,980	0.785	2522	+1.00	80.0	.00672	.00000340
BC	+2,360	36	65.5	+1.58	126.5	.01316	.00000875
CF	− 800	36	22.2	0	63.2	0	0
						.05062	.00002562
						D	$\Sigma \frac{u^2l}{aE}$

$$H = \frac{.05062}{.00002562} = 1{,}975 \text{ pounds.}$$

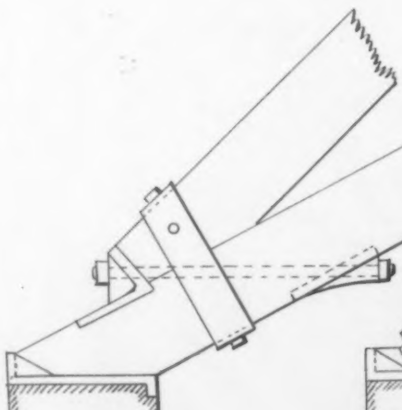


Fig. 109

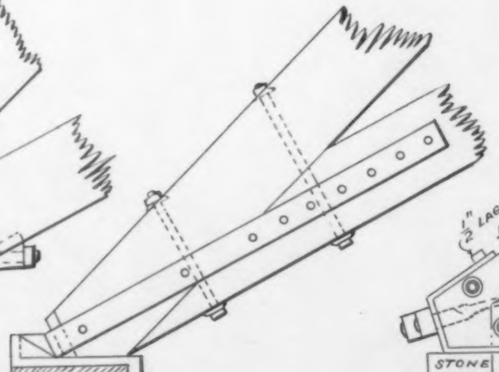


Fig. 110

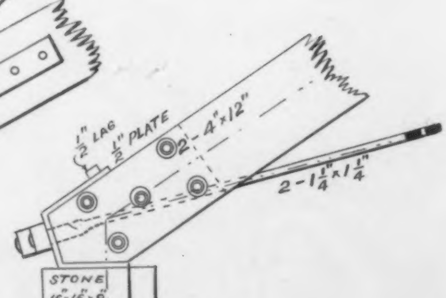


Fig. 111

As He Is Known, Being Brief Sketches of Contemporary Members of the Architectural Profession.

EDWIN HAWLEY HEWITT

EDWIN HAWLEY HEWITT was born in Red Wing, Minn., in March, 1874. After a partial course at Hobart College he entered the University of Minnesota in the sophomore class in 1893, graduating with the degree of A.B. in 1896. He then went to the Massachusetts Institute of Technology, where he studied during the winter of 1896–1897. The next three years were spent in the offices of Shepley, Rutan & Coolidge; Wheelwright & Haven, and others. He was married in 1900 and went at once to Paris, where he entered the École des Beaux Arts in May, 1901. He stood at the head of all the foreigners in the entering class, becoming a member of the Atelier Pascal. In October, 1904, for private reasons, he was forced to return to the United States, but he had completed his work at the École and expected to return there for his diploma. Arriving in Minneapolis, he was almost immediately offered a commission and at once started in on private practice, not having an opportunity to return to Paris for over eight years.

As time went on he realized the importance in architectural work of the allied science of engineering in all its branches, and in September, 1910, he formed a partnership under the name of Hewitt & Brown, architects and engineers.

Mr. Hewitt has always taken the highest interest in all things pertaining to architecture and art, and was most instrumental in the hard work which culminated in the completion of the Minneapolis Institute of Fine Arts. He has also taken a most active part in all things pertaining to the state in artistic lines and is president of the Minnesota State Art Society. He became a member of the American Institute of Architects in 1913, and for the past two years has been the active president of the Minnesota Chapter of the American Institute of Architects.

Mr. Hewitt has taken a leading part in the advancement of all things architectural in the Northwest, and it is largely due to his efforts that the architects of the Northwest are all in close touch and harmony with one another. It is also due to his efforts that the Architectural School of the University of Minnesota has been brought into close touch with the profession and that the architects of the Northwest are taking an active interest in the school work.

He has the rare gift of visualizing a project in its entirety and seeing what is the appropriate and the proper thing for the specific case. —*E. H. B.*

LOUIS CHRISTIAN MULLGARDT

"LOUIS CHRISTIAN MULLGARDT is emphatically an original designer. The freshness of his vision and the novelty of many of his technical expedients will be manifest to the most superficial observer, while at the same time it is equally obvious that his innovations have not been conceived in any perversity of spirit. He is a man who goes his own way, because he has to go his own way."

This, in part, is what Herbert D. Croly, author and editor, wrote of Mr. Mullgardt after he had made a critical study of his work. Mr. Croly's analysis accounts for the originality and beauty of Mr. Mullgardt's "Court of the Ages," and other structures designed by him at the Panama-Pacific International Exposition. The Court of the Ages has commanded such universal expressions of approval by architectural critics and the public in respect to distinctive composition, style, and infinite detail as to ensure its permanency in the annals of architecture.

The work of Mr. Mullgardt consistently divulges its creator's wide versatility. It cannot be classified as belonging to any previous style, but there is something about it, perhaps its very quality, that betrays its authorship.

Mr. Mullgardt came from London to San Francisco in 1905. He is a native of Missouri. His earlier years were spent in St. Louis, where he began the study of architecture. Subsequently he continued his studies in Boston and at Harvard. Following this, he went to Chicago, where he first became engaged as designer of important work. In 1893 Mr. Mullgardt entered private practice in St. Louis. In 1895 he made an extended trip to Europe for further study. In 1902 he was commissioned to go to Manchester, England, and in 1903, to London to execute important work there and in Scotland. The results of his labors for the next two years before coming to San Francisco, could they be noted here in detail, would be most complimentary testimonials of his genius.

To his accomplishments as an architect and sculptor should be added those of artist and writer, he having contributed liberally to magazines, particularly those relating to architecture.

Mr. Mullgardt is president of the California Society of Etchers, vice-president of the San Francisco Society of Artists, director of the San Francisco Art Association, ex-president of the San Francisco Society of Architects, and member of the International Fine Arts Jury of Award of the Panama-Pacific International Exposition. —*W. F. B.*

ALBERT KELSEY

ALBERT KELSEY'S manifold and useful activities would seem to belong to a life begun much earlier than 1870. Born on April 26 of that year, in St. Louis, and resident since boyhood in Philadelphia, he entered upon his architectural apprenticeship when scarcely more than a lad and speedily became active in the community interests of his new world, seizing with avidity upon the opportunities offered by the T Square Club, then newly organized for the benefit of draftsmen. Its atmosphere of enthusiasm undoubtedly gave stimulus and direction to his eager and forceful nature, while the comradeship of older men in the work of the study classes, competitions, and sketching trips became to him an effective course of training in architecture. From this he naturally became a club leader, giving indefatigable service in and out of office. He suggested and was first president of the Architectural League of America, whose work, until the growth of the Beaux Arts Society's atelier system rendered it no longer necessary, was an effective agency for good among younger members of the profession. From this training school to active work in the Institute was a natural transition and to the older organization, especially in its local chapter, Mr. Kelsey has also given unselfish and effective service.

In 1896, as a foreign traveling scholarship holder, he studied town planning while abroad, and returned an ardent propagandist of civic improvement, carrying its doctrines, as a lecturer, far and wide through the country. In 1903 he devised the exhibit on municipal improvement at the St. Louis Fair, after foreign study of the subject as chief of that division, while in Philadelphia the first of the plan schemes for the epoch-making parkway was proposed by him. These manifestations of public spirit find their natural reflex in his private practice, which is marked by a total absence of commercial spirit and a mental attitude of painstaking care, perhaps best illustrated in his Olmsted Monument at Harrisburg and the Philadelphia branch library at 65th street and Girard avenue. In the latter, also, the "thematic" character of the decoration is an index of his conviction that a building should be brought into relationship with its place and people and given root in the soil of their traditions in order that it may tell its story in a living tongue.

Mr. Kelsey's association with Paul Cret upon the Pan-American Building at Washington brought into his life not only its most notable architectural success, — with credit enough to its authors for any three architects, — but also its most potent influence in the contacts afforded with Charles F. McKim and Elihu Root, for to these men, he will tell you, he owes his chief inspiration to thoroughness and high idealism. To his intimates "Bert" Kelsey, in spite of his long and strenuous career, is still a boy at heart, with a boy's capacity for fresh enthusiasm and ardent partizanship in every good cause. — *W. P. L.*

HAROLD VAN BUREN MAGONIGLE

THERE used to be a comfortable tradition among biographers that ancestors were not only worthy of being asked to grace the occasion, but that they were entitled to a respectful prominence and a due modicum of credit. Of late, this ancient custom seems to be more honored in the breach than in the observance. And yet, in the present instance, it seems interesting to know that the great-great-grandfather of him whose portrait is here sketched was an Irish poet whose revolutionary proclivities were too ardent even for the little island, which is generally thought to be not ill disposed to belligerent natures. From it he was exiled, in due course. It also seems of more than passing moment to know that Mr. Magonigle's immediate forebears came from Scotland and Holland, at which point the traditional biographer would take occasion to point out that no ancestral tree could possibly offer a better combination of the qualities essential to the making of an architect than one which had been nourished by the brilliant imaginative and poetic qualities of the Celt, the not less brilliant keenness of the Scotch, and the modest patience of the Dutch. I do not know what part these ancestral influences may play nor how much they have contributed to what seems to me to be the admirable sincerity of Mr. Magonigle's work.

Possessing a facility with pen and pencil which have won him renown as a draftsman, Mr. Magonigle resists all the artful temptations which lure less able men into the wiles of architectural trickery, and though his renderings sing with the beauty of line and color, they also speak truth. It ought not to be forgotten that the same admirable sincerity guides Mr. Magonigle in his relations to the profession and in his labors for its welfare. Of these latter, he gives generously to the Institute and his Chapter.

Mr. Magonigle began his association with architecture in the office of Vaux & Radford, but later, stimulated by the influence of gothicism in the office of Mr. Charles C. Haight, and by that of classicism in the office of McKim, Mead & White, where he remained for several years, Mr. Magonigle went to Boston, and, entering the office of Rotch & Tilden, tried for the Rotch Traveling Scholarship, which he won in 1894. The two following years were spent in Italy, France, Greece, and England. Returning to America he reëntered the office of McKim, Mead & White, and began practice in 1897. For two years he was associated with Mr. Evarts Tracy, and for two more years he was at the head of the office of Schickel & Ditmars. Since 1901, except for a brief partnership with Mr. Henry W. Wilkinson, he has been in practice under his own name. During these years of study and development, Mr. Magonigle learned the inestimable value to an architect of touching life at many points. Few architects have so wide a range of interest and so many avenues of contact with the broad heritage of art. They are, I opine, the sources of his sincerity. — *C. H. W.*

PLATE DESCRIPTION.

Winifred Masterson Burke Relief Foundation, White Plains, N. Y. Plates 91–96. Of this proposed group there have been completed at present the administration building, the superintendent's house, the hospital, the dining hall and servants' building, the boiler and power plant, the laundry, four cottages and the arcaded passages forming the central quadrangle.

The institution is not a hospital but a home for convalescents, and considerable attention has been given to produce buildings where the patients may be as free as possible from the institutional atmosphere so characteristic of hospitals.

The administration building has the usual receiving rooms, examination rooms, and offices on the first floor, while above are quarters for the staff and nurses and dormitories for some of the help. To the south is the superintendent's house, a complete residence sufficiently isolated but with direct access to the administration building. On the opposite side is the small hospital. Balancing the administration building, on the opposite side of the quadrangle, is the dining hall, with the large kitchen and several dining rooms for various groups of patients and employees. The remaining sides of the quadrangle will be closed in the future by the assembly building and the nurses' home.

The four cottages now built are those on either side of the administration building. It is these small units holding only twenty patients each, and planned with a comfortable sitting room and spacious loggia on each floor, which assist so materially in defying the character inherent to most medical institutions.

Craig Apartments, Chicago, Ill. Plates 97, 98. The particular interest of this building lies in the adaptation of the plan to a corner lot. It is so arranged that the space usually given to a courtyard in the rear is here used as a fore-court over which the various living rooms have their exposure.

The construction is of ordinary brick bearing walls with all interior structure of wood. Bedford stone is used for trimmings, while brick quoins accent the corners. The roof over the central part is covered with gray slate.

The English basement is divided into main entrance lobby and the usual janitor's quarters, boiler room, laundries and store rooms. The entrance lobby has a black and white cement tile floor, with black marble base, plaster cornice, and wall panels. Above the basement are three stories with four apartments on each floor. The living rooms and dining rooms are trimmed in birch with walnut and mahogany finish, while the kitchen is of natural finished birch. All the other rooms are finished in enamel.

Apartment House, Buffalo, N. Y. Plates 99, 100. In this building there are thirteen apartments, four of them being duplex. The apartments average 1,600 square feet each, except those which are duplex and average 3,000 square feet.

Steel framing has been used with concrete and hollow tile floor arches and brick exterior walls. The front stair halls are finished in Caen stone cement lined off in joints, with oak entrance doors and casings to all apartments. The finish of the apartments is simple: the plasterwork has been painted gray and the woodwork white with French walnut doors, all dull finish, except in the service portion, where there is a washable gloss finish.

A part of the basement is used as tenant space because of variations in the grades. The rest is occupied by janitor's quarters, boiler room, laundries and ironing rooms, and individual storerooms for each apartment.

South Side Bath House, Pittsburgh, Pa. Plates 101, 102. This building was erected from funds left by the will of a Pittsburgh citizen and was recently officially given to the city. It is located in the congested mill district of Pittsburgh on a lot with a frontage of 58 feet and a depth of 93 feet, and accommodates about two hundred.

The construction is fireproof throughout. The exterior walls are of brick laid with wide raked joints and buff Bedford stone trimmings, with granite steps and base course. The roof of the flat portion is vitrified tile, while the pitch roof is covered with mottled purple and green roofing slate. The windows throughout are hinged at the bottom with the top coming in, so that there can be no view of the interior from the outside at any time.

In the basement are located gas fired boilers to heat the building and the water for the pool, a pump to circulate the water and fans for ventilating the building. A fully equipped laundry is also in the basement. In addition to the space occupied by the pool, the first floor has a vestibule, office and shower room. In the front part of the second floor are a large toilet and a tub bathroom, while on a balcony running along two sides of the pool room are the dressing rooms, consisting of marble partitions, with fine grille work overhead. The pool room, which extends through the entire height of the building, is finished in brick and terra cotta, the pool itself being lined with enameled brick. The entire building is lighted by electricity to allow night bathing.

Kindergarten, Downers Grove, Ill. Plates 103–105. The plan of this building is the outcome of the theory of its builders that kindergarten groups should be small. There are two complete units which are identical in arrangement, one on each floor. Each unit is devoted to a class of thirty children and three teachers. In the work which is done in a large class the three teachers co-operate in the central room, but for the greater part of the time the children are divided into three groups of ten each, one group remaining in the large room and each of the other two going to one of the group rooms to the north or south.

The administration and service part of the building is at a level halfway between the two kindergarten floors and serves as an entrance through which all persons must pass to enter the other portions of the building. In this part are the director's room, the teachers' room, the kitchen, the heating apparatus and the toilet and locker rooms for each class.

The construction is of brick, with paneled frame second story and slate roof. The floors are of wood construction and are covered with cork tile, giving a most agreeable color and texture. The stairs have been so planned that access and escape are easy and in opposite portions of the building, minimizing the risk from fire.

EDITORIAL COMMENT AND NOTES FOR THE MONTH

CITY-PLANNING in its broadest phase and in particular detail is fortunately now receiving a great deal of attention and study. The first national city-planning conference was held in Washington in 1909, and since then there has been one each year in various parts of the country. This year the conference was in Detroit on June 7, 8, 9, and is reported to have been the most successful held thus far. It is gratifying to note that the attendance included real estate men and property owners who took a prominent part in the discussions.

The subject of city-planning is a very comprehensive one, including, as it does, every branch of a city's growth. While an æsthetic result is always dreamed of as the ultimate, there will be no value in such a result unless it be attained after a study of many less ideal considerations. The first step, therefore, in any city-planning undertaking is to make a careful investigation of the conditions existing in the community. In case a new section or area is to be planned these conditions are purely physical, but their importance must be thoroughly understood. When the planning is in relation to an existing city, a survey of the actual conditions of that city must be made, particularly of the working and living conditions. This study should lead to a forecast of the future growth of the city and its resultant requirements, for in order to plan comprehensively the vision must be of the probable city, even a hundred years hence.

This economic and social aspect of city-planning is not the only phase, but it constitutes the first step to be taken. A plan based on such study and survey will create opportunities for landscape developments and architectural embellishments which, in turn, should receive the same careful study. In the early days of city-planning all the emphasis was laid on the æsthetic consideration, but with the inception of the city-planning conferences a tendency developed to lay the stress on the social and economic considerations. There has been evidence of this lack of balance in schemes where real economic value has been accompanied by absolutely inadequate architectural treatment. Active co-operation of the architect must be obtained if serious and far-reaching mistakes are to be avoided in this matter.

The professional training of the architect particularly fits him for effective activity in city-planning. He has had to face questions of economics; he has been handicapped by mechanical and physical considerations in his æsthetic achievements; he has been through the experiences that are to be met by the city planner, and consequently his power in this connection is not limited to the æsthetic problems that may be created, but is of great value in the earlier work of survey and study.

The development of city-planning in America has taken place so far principally through the medium of city-planning boards or commissions in the various cities. Few of these commissions have any power to act, but are purely advisory boards, acting with the other city departments which are endowed with the necessary powers. A commission of this kind has great value, not alone as a body which may give advice on any particular question, but it has an indispensable purpose, in that through it as a clearing house may be attained a unity of conception which is the primary condition of good city-planning.

In most cases these commissions are composed of private citizens serving without pay. Here lies a field of work which is open to the architect — a place where he may exert his influence and help maintain the lead of the profession in the creative work of his community. Some few may have an opportunity to direct a real estate development, and by careful study produce an æsthetic result and at the same time a judicious investment; some others may have the exceptional opportunity of laying out a comprehensive scheme for a new city or for the re-planning of an existing city. These individual opportunities are distinctly limited, but to all is open an opportunity at all times to advise, to stimulate, and to direct the activities of the community in this work which holds such great hope for the future of architecture.

YALE UNIVERSITY honored Ralph Adams Cram at the recent commencement by conferring on him the honorary degree of Doctor of Laws. In granting the degree the following comment was made: "By teaching and by practice, to revive Gothic forms and adapt them to modern uses — this has been Mr. Cram's labor, this is his distinction. The soul of man requires the pointed arch, and as such works of past genius disappear, modern genius must give us its substitute."

At Harvard, Horace Trumbauer was given the honorary degree of Master of Arts with the statement: "Architect of the Harry Elkins Widener Memorial Library; they who enter its doors will ever admire the design and the adaptation to the use of a company of scholars."

THE Natco Two-Apartment House Competition was judged at Boston, July 12. The members of the jury were: H. J. Carlson, Boston; H. L. Duhring, Jr., Philadelphia; Arthur W. Joslin, Boston; Edward L. Palmer, Jr., Baltimore; Thomas E. Tallmadge, Chicago, Ill. The following awards were made: first prize, Olaf William Shelgren, Buffalo, N. Y.; second prize, Hugh Macomber Ferriss, New York City; third prize, J. Ivan Dise, New York City; fourth prize, Maurice Feather, Watertown, Mass. The mentions: William H. Flanigen, Woodbury, N. J.; Frederick J. Feirer, Ridgefield Park, N. J.; Emil F. Hasenbalg, Chicago; R. F. Walker, Melrose, Mass.; Cleon M. Hannaford, Boston, Mass.; Arthur J. Pohle, Albany, N. Y.

THE BRICKBVILDER COLLECTION

EARLY AMERICAN ARCHITECTURAL DETAILS

DOORWAY, FRENCH-MUNROE HOUSE, BRISTOL, R. I.
BUILT IN 1800

MEASURED AND DRAWN BY

V GORDON ROBB & M. A. DYER

Plate Eight

(over)

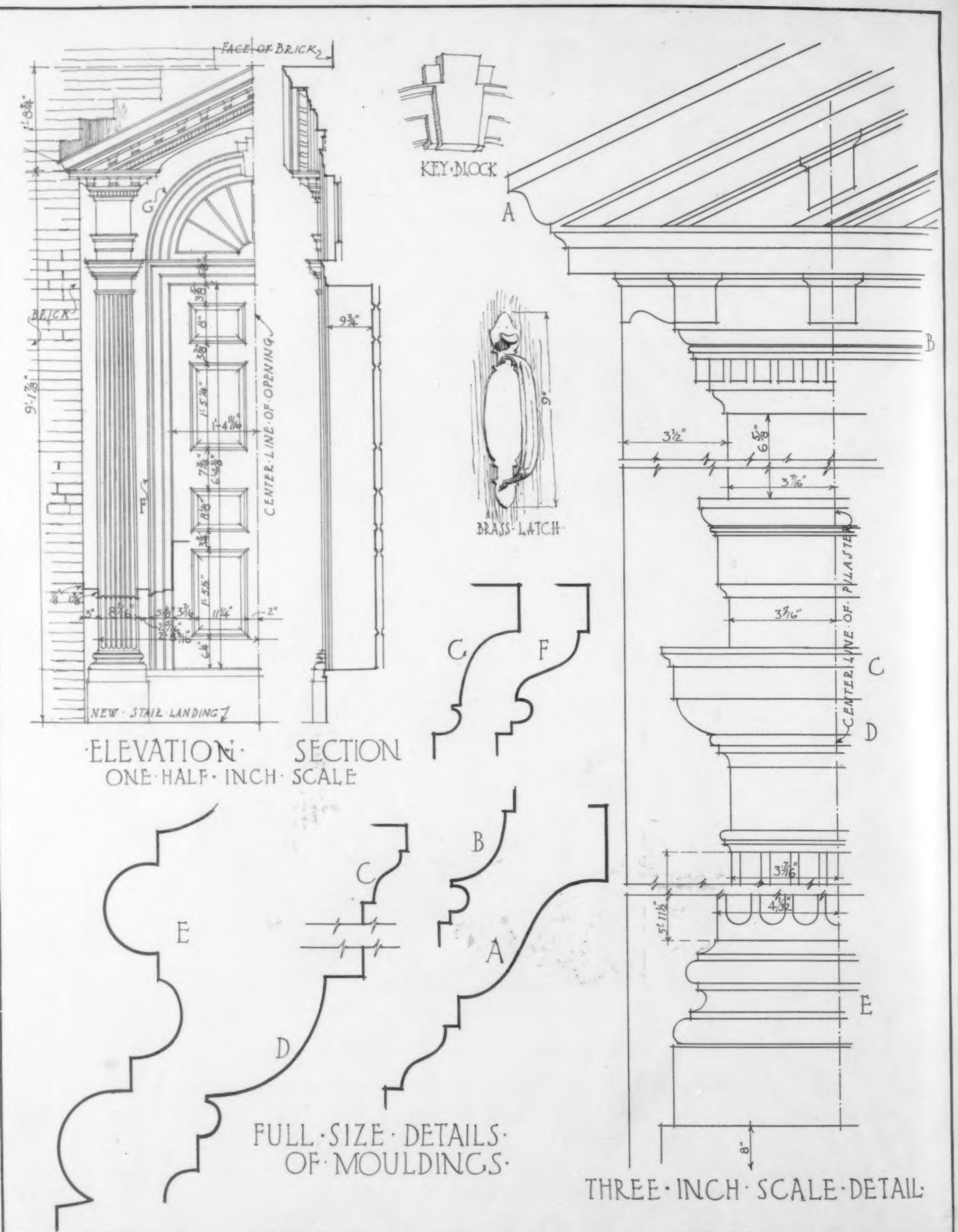


PLATE 8 AUGUST 1915	DOORWAY·FRENCH–MUNROE·HOUSE· BUILT·IN·1800 BRISTOL·R·I·	MEASURED·& DRAWN·BY· GORDON·ROBB· & M·A·DYER

A COMPOSITION OF WREN'S BUILDINGS
BY C. R. COCKERELL, R.A.